No. 1845
Vol. XLV

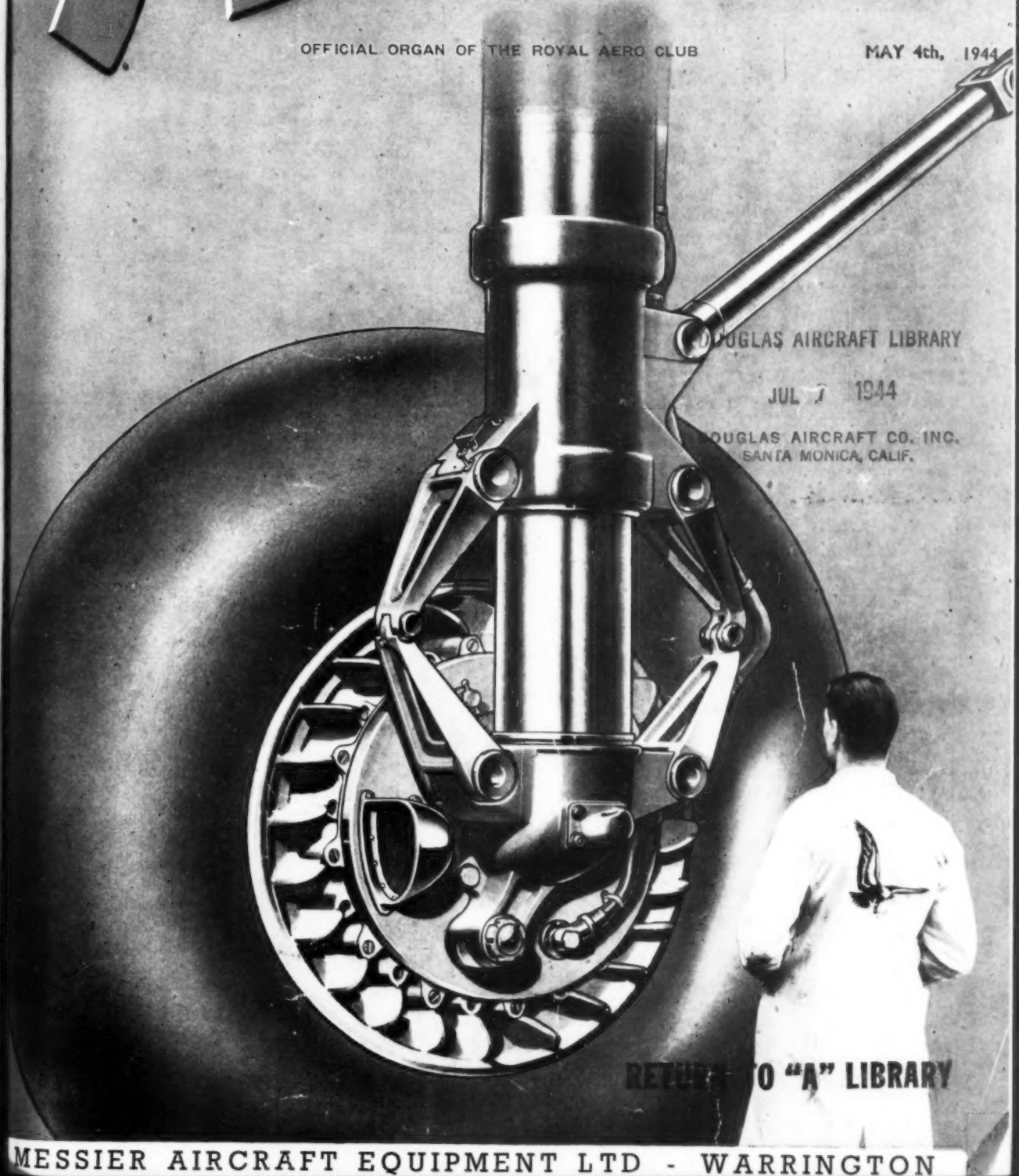
1/-

FLIGHT

and The AIRCRAFT ENGINEER

OFFICIAL ORGAN OF THE ROYAL AERO CLUB

MAY 4th, 1944



DOUGLAS AIRCRAFT LIBRARY
JUL 7 1944
DOUGLAS AIRCRAFT CO. INC.
SANTA MONICA, CALIF.

RETURN TO "A" LIBRARY

MESSIER AIRCRAFT EQUIPMENT LTD - WARRINGTON

THE SLEEVE VALVE EXPLAINED . . . . No. 1

MINIMISING WORKING PARTS

There is nothing complicated about "Bristol" sleeve valves or their operating mechanism. Basically, each valve is a steel cylinder with four ports at the top and an operating band at the base.

A ball-joint is attached to this band to accommodate a driving-crank, and all sleeves are operated through a train of gears; the master being located on the engine crankshaft. Working parts are reduced to a minimum.

There are no cams, tappets, rockers, or valve springs; therefore valve bounce and its attendant loss of power is impossible.

Once the engine is assembled, valve timing is positively determined; and the usual valve inspection and adjustment routine, so necessary with other engines, is entirely eliminated.

Once you realise the advantages of the sleeve valve you will understand the reliability of

"Bristol"

SLEEVE VALVE AERO ENGINES

FLIGHT and The AIRCRAFT ENGINEER

First Aeronautical Weekly in the World : Founded 1909

Editor C. M. POULSEN

Managing Editor G. GEOFFREY SMITH, M.B.E.

Chief Photographer JOHN YOXALL

Editorial, Advertising and Publishing Offices: DORSET HOUSE, STAMFORD STREET, LONDON, S.E.1
Telegrams: Truditur, Sedist, London. Telephone: Waterloo 3333 (35 lines).

COVENTRY:	BIRMINGHAM, 2:	MANCHESTER, 3:	GLASGOW, C.2:
8-10, CORPORATION ST.	GUILDHALL BUILDINGS, NAVIGATION ST.	260, DEANSGATE	26B, RENFIELD ST.
Telegrams: Autocar, Coventry.	*Telegrams:* Autopress, Birmingham.	*Telegrams:* Iliffe, Manchester.	*Telegrams:* Iliffe, Glasgow.
Telephone: Coventry 5210.	*Telephone:* Midland 2971 (5 lines).	*Telephone:* Blackfriars 4412.	*Telephone:* Central 4857.

Registered at the G.P.O. as a Newspaper.

No. 1845. Vol. XLV. May 4th, 1944. Thursdays, One Shilling

The Outlook

Identification Difficulties

ALTHOUGH generalisation is always apt to be dangerous, and lessons learnt in one campaign can rarely be applied without qualification to another, it is natural that the invasion of Italy should be examined for possible pointers as to how the invasion of Western Europe may be expected to unfold itself. Geographical and military conditions are, of course, very different, but the two will at any rate have this in common, that vast fleets of surface craft will transport the majority of the Allied Forces to the point or points at which the attack is launched, and that, one must assume, airborne troops will figure in the scheme.

Recently a writer in the *New York Daily Mirror*, in commenting on the announcement issued some time ago by the U.S. Army that in the invasion of Sicily 23 air transports were shot down with some 400 men on board by Allied naval and ground forces as well as by enemy action, asserts that even this is not the whole grim tale. He states, according to Reuter, that three days later we lost a second wave of 21 air transports, all shot down by Allied naval gunners.

It is known that during the invasion of Sicily the Allies did not use a great variety of air transports, nor were the numbers so formidable that the very magnitude of the operation would excuse such dismal failure to recognise our own aircraft (the U.S. Army announcement referred to 2,500 troops, which would involve something like 100 aircraft or a little over).

Unfortunately there is little reason to believe that recognition in the Allied armies and navies has improved greatly since last summer, and if, in the forthcoming invasion of Western Europe, our air transports are to lose one-third of their strength by our own guns, the outlook is such that our air chiefs might well be justified in insisting that a much stricter control should be exercised over itching trigger fingers. After all, the Services have had available almost unlimited sources of aids to aircraft identification and if, after four and a half years of war, the Army and Navy have failed to profit by these, there appears to be something seriously wrong somewhere.

A Supra-national Air Force?

THE Labour Party has issued a statement, which will be considered by the party's annual conference at Whitsun, outlining its policy for the future of both military Air Forces and commercial air transport. The former subject is dealt with first and, more briefly, but the proposals are so far-reaching that they deserve full examination.

Almost anybody could have guessed beforehand that the Labour Party would favour the abolition of all national Air Forces and the creation of what it calls a supra-national Air Force. In support of this the party states that "the people of London and Coventry, and still more the people of Berlin and Hamburg, have reason to know that the life of cities above-ground will become impossible unless the danger of air-borne devastation is mastered."

This statement raises the question: Would not all civilised life in Europe have become impossible if the United Nations had not possessed the power to cripple the production centres of the aggressor nations? That question can only be answered as time brings to light the precise share which the independent use of air power will have borne in the defeat of the aggressors; but on general grounds one must deprecate the idea of placing the operations of aggressors and those of the peace-loving nations on the same footing.

In the second place, the Labour Party has evidently

selected air power as the single weapon by which the guardians of the peace shall enforce their will. Presumably this means a striking force of bombers with such ancillary services as fighter escorts, reconnaissance machines, airborne troops, air ambulances, etc. If we had to choose one single weapon for restraining an embryo aggressor, we should prefer airborne troops. There would always be a natural reluctance on the part of any sort of League of Nations to order a bomber force to strike.

In making a selection of one weapon the Labour Party ignores the modern and very salutary tendency to achieve results by using two or all three of the fighting Services as one unit to achieve some object. That is excusable when one is dealing not with a full-fledged belligerent, but with a scheming would-be aggressor, who is secretly preparing to rearm. Airborne troops should be able to deal with his camouflaged factories.

The chief ground for criticism of the Labour Party's scheme (whose objects we must all approve) is that it places command of the world's police force (whether aerial or otherwise) under some supra-national authority. Everything at the moment points to the necessity of the world's peace being guarded by the four great Allies: Britain, the United States, Russia and China, with the probable addition of France before long.

Internationalisation

THAT the Labour Party's booklet should advocate the internationalisation of civil air lines causes no surprise. Spokesmen of the party had already made that clear in speeches in the House. That there should be some form of international control most people will agree. But international ownership and operation is another matter. That may come in time, but before the world is ready for this a great many other aspects will have to be internationalised.

Evidently the Labour Party realises this for the booklet outlines a so-called interim policy in which the minimum acceptable (by the party) items are a World Air Authority, a unified World Airways or, if that cannot be managed, a system of Regional Air Unions. Five of these are suggested: Europe, the British Commonwealth, the Americas, the Soviet Union, and East Asia. The United Kingdom, it is pointed out, would have a part in both the European and the Commonwealth Unions, just as Canada might be a party to both the Commonwealth and the Americas Unions. Each Union would arrange with the others intercommunication on reciprocal terms.

Here the Labour Party is coming down to earth and is not, it appears to us, greatly at variance with what other sections of the community desire. In any case, this country cannot act alone in this matter and must be largely guided by what America and Russia will agree to.

CONTENTS

The Outlook	463
War in the Air	465
Tactical Air Support	467
Here and There	468
Round the Spitfire XII	471
Behind the Lines	472
Flying Fortress (B-17G)	473
Aircraft in Flying Attitudes	478
Future of Civil Aviation	480
Correspondence	485
Service Aviation	487

TWO MILES TANDEM MONOPLANES: The upper picture shows the M.35 flying mock-up, which was designed, built and flown in six weeks in 1942. The M.39 B. "Libellula" in the lower picture is a twin-engined tandem. An article on tandem monoplanes appeared in our issue of April 27th. Other pictures on p. 470.

WAR in the AIR

Second Airborne Landing in Burma : Surprise Attack in New Guinea : Pre-invasion Bombing of Continent

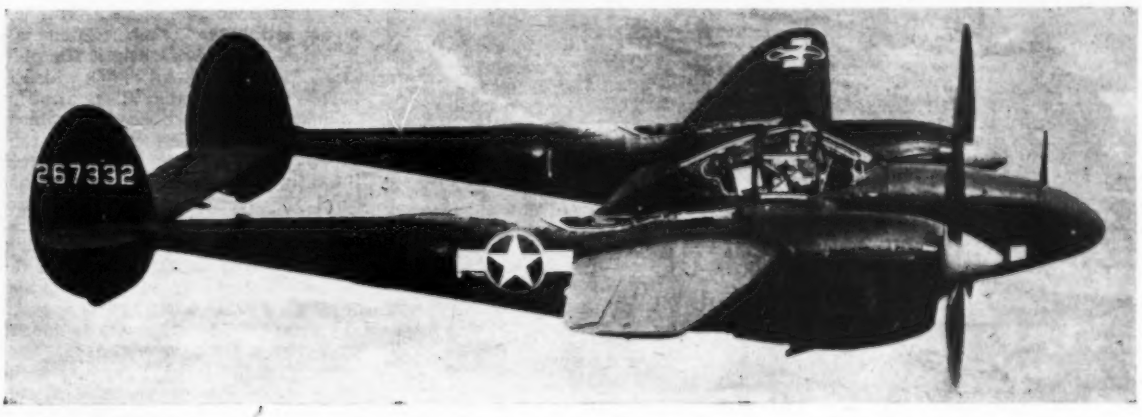
WAITING FOR THE "GO": Airspeed Horsa gliders lined up and waiting for loading and take-off.

THERE has been a second airborne landing behind the Japanese lines in Burma. The troops landed on ground occupied already by a British-Indian force, which in March had marched into Burma from the north and crossed the river Chindwin in boats and rafts dropped from the air. This force found a suitable piece of ground, and sent back news; whereupon the American Air Commando, headed by Col. Philip Cochran, flew in engineers and equipment, and in a few hours a strip capable of accepting transport aircraft was laid out. Troops were then flown to the spot to reinforce the men already there. The landings were brought off without mishap, which was more than could be said for the original landings of the Wingate force.

That was one nasty surprise for the Japanese. They have had another in New Guinea, where seaborne landings have been made on the extreme western tip of the huge island, at Hollandia and other spots. The regular technique was followed, aircraft and artillery preparing the way; but the Japanese were caught unprepared, and opposition was slight.

For the first time in the Pacific campaign ground forces of the R.A.A.F. were put ashore on the actual day of the invasion. Their main object was to prepare airstrips for their own aircraft to land, but they also used bulldozers to clear lines of fire and did other engineering work. The men had had a thorough training beforehand in the sort of work they would have to do, and the life they would lead. They carried all their kit on their backs, and of course that kit had been cut to bare necessaries.

Air Marshal Sir John Baldwin, A.O.C. the 3rd Tactical Air Force (which is in the South East Asia Command), has issued an order of the day, remarking that the force had been formed just over four months ago, and



P.R. LIGHTNING: Armed only with cameras instead of guns the P-38-F5 is one of the standard photographic reconnaissance types of the U.S.A.A.F.

WAR IN THE AIR

that it was its job to seek out, harass, and destroy the Japanese Air Force on that front. The enemy's first-line strength was assessed at between 200 and 250 aircraft with a proportion of three fighters to each bomber. No. 3 T.A.F. had, in the four months, obliterated 175 fighters and 69 bombers, and had probably destroyed or damaged another 151 machines. The A.O.C. called on his men to continue to give their ground forces that immunity from air attacks which they had so far enjoyed.

Wily Tactics

AWAY in the West, Sir Arthur Harris and his staff have given another example of their fertility of resource. A great deal of the success of a bombing raid depends on the skill of the routeing. Last week a strong force of Lancasters and Halifaxes was sent against Munich, and in order to mislead the *Luftwaffe* fighters part of the force flew across the Alps in the direction of Milan, and then turned north-eastward, crossed the Alps again, and reached Bavaria. The defence of Munich consisted almost entirely of *flak*, which showed that no strong force of fighters was there. The bombers came back on a straight line, having covered about 2,000 miles. Our losses during the night (there were other raids) were 29 machines.

Following on the clever routeing of the bomber attack on Munich there was an almost equally adroit attack on Essen, where 34 buildings had been patched up and four completely rebuilt in the last six months. The progress of the work had been watched by our reconnaissance machines, and when the repairs had reached a worthwhile stage Bomber Command struck again.

Essen, however, belongs to the long-range policy. Heavy industry does not much concern the battles of the immediate future, though it has an important influence on the enemy's power of sustained resistance. Just now the whole world is agog, waiting for news that the British and Americans have landed somewhere on the fortress of Europe. For that reason more interest attaches to the bombing of communications and other targets which, though repairable in time, are likely to have a bearing on the battles of the invasion. If railway yards like those at Hamm are put out of action for the present, the German attempts to move their reserve forces up to the critical points of the invasion may be seriously thrown out of gear.

The minds of all in Germany are full of thoughts about reserves, and one official broadcaster sought to inspire confidence by talking about the reserves of fighters which have not yet been thrown into the fight, and also about alleged underground aircraft factories which cannot be destroyed by bombing. The truth of the former assertion is admitted, and of late the *Luftwaffe* has avoided losses of fighters by declining to dispute the passage of numerous American daylight raids. The story about underground factories is not believed in well-informed quarters in London.

BATTLE OF NEW BRITAIN: Australian-built Bristol Beauforts of the R.A.A.F. flying to attack Japanese installations on the Paronga river in New Britain.

WINGED: Sqn. Ldr. Bryan, famous as a "ship-strafer," inspects what is left of his Typhoon's starboard wing after a convoy attack.

Mines in the Baltic

SIDE by side with the recent intensive bombing of railway centres has gone a notable increase in mine-laying activity by Bomber Command. It is believed that Danzig is the only Baltic port in German hands which is now open to sea traffic. The entrances to neutral ports have also been mined, and the other day it was reported that 32 vessels were lying in a certain Swedish port, unable to venture out until the overworked fleet of minesweepers had made the exit channel safe. Neutral Governments may like to make profit out of trade with the nearest belligerent, but they do not want their ships to be blown up; and the crews of the ships are in hearty agreement with that sentiment.

And so, day after day, and night after night, the "softening" process has been carried out by British and American bombers of every category. No excitement is aroused in the minds

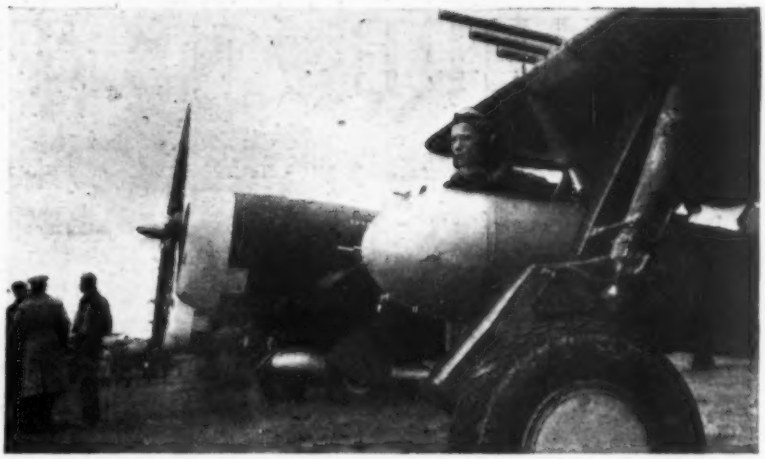
WAR IN THE AIR

of the British public by an announcement that either nation has sent out a force of 1,000 machines.

For several days on end there was no important fighting on either the Italian or the Russian fronts. It is perhaps legitimate to speculate that on both those fronts expectations are also tense; and that when the news of the invasion in the West is made known all the fronts will flare up again.

Reich Air Ministry Hit

LAST Saturday a daylight raid by some 750 U.S. Fortresses and Liberators with a fighter escort of about the same strength was directed at Berlin. Thick cloud covered them for most of the way in, but over the city there was furious opposition by *Luftwaffe* fighters. Among them some Fw 190s (double-fuselage fighters something like Lightnings) were seen for the first time. The raiders lost 63 bombers and 14 fighters, but claimed to have shot down 77 enemy machines. The new Reich Air Ministry is believed to have a very thick concrete roof, but it was certainly damaged.



THOR'S LONG ARM: Thunderbolts with long-range fuel tanks. The bomber version has one beneath the fuselage and the fighter version one in each wing.

Tactical Air Support

Close Liaison with Ground Forces : Multi-purpose Mustangs, Thunderbolts and Lightnings

ONE of the very first lessons to be learnt during the present war was the indispensability of air superiority in any military undertaking. What took longer to learn was the best way to co-ordinate air and ground forces in order to obtain maximum effect with minimum expenditure of man-power and materials, but it is now universally agreed that the two are interdependent and that the closest liaison is essential to success.

How thoroughly this is appreciated by the American Forces based in Great Britain was demonstrated when *Flight* paid a visit recently to the U.S. Ninth Fighter Command, under Brig.-Gen. E. R. Quesada, which can be taken as a typical unit of the overwhelming Allied Expeditionary Air Force now ready to blast the enemy out of the Continental skies, shatter his army's communications and provide the closest support for our invading land and sea Forces.

Three distinct duties fall upon an air unit operating in the area of ground forces it is supporting, namely, offensive action against enemy ground forces, defence against enemy air attacks on our own ground forces, and reconnaissance both visual and photographic. At present the Ninth Fighter Command's activities are concentrated upon the first and third of these jobs as applied strategically and *Flight* was present at the briefing of a useful force of Thunderbolt pilots who, less than half an hour later, took off to attack a railway target in Belgium. Next morning the B.B.C. announced that U.S. aircraft had successfully attacked marshalling yards at Louvain, near Brussels.

The briefing was done by the colonel who was to lead the mission. He gave them their route, showed them on the map how they would approach the target, and finished by warning them against casual "strafing" in enemy-occupied territory on the way back. He spoke quietly—almost casually—but his instructions were clear and complete, and none of his pilots needed to ask any questions afterwards. Similarly the "met." officer gave them the necessary information on wind direction and speed, and conditions on the way and over the target. No time was wasted and yet there was no apparent haste. We walked over to the control tower and climbed to its roof with Gen. Quesada. In only a few minutes the Thunderbolts, fighter-bombers and escort-fighters, were taxying along the perimeter track, each with a long-range tank under its belly and, in the case of the former, a hefty bomb under each wing. They took off in pairs at perfectly timed intervals of a few seconds, tucking up their legs as they swept past the control tower; they formed into flights over the airfield while a Stinson Sentinel, waiting to land, stoodged around until the last P-47 was clear, and in a few moments they were out of sight on their way to Belgium.

To return to the rôle this unit will play in support of ground forces, we saw much on this airfield which may not be mentioned here, but a most convincing demonstration was given of how that close liaison between air and ground will be achieved when the big attack on the European Fortress is launched. In the Command Post, where Air Force and Army commanders live and work side by side, there was staged an example of how a request for air action at a certain point would be handled. The idea was that enemy heavy guns were holding up an attack by our armour in a certain sector, and would the Air Force please deal with them. The Army explained just why our own artillery could not get at them, and it took less than five minutes' discussion with the aid of a large map to decide everything and send a "reccy" aircraft to pin-point the troublesome guns while the fighter-bombers prepared to take-off.

Another demonstration showed how an air support party pushes its communications as far forward as possible with minimum delay. A CG-4A cast off from its C-47 tug, made an accurate spot-landing at our very feet (yes, we backed away hurriedly!) and disgorged a jeep complete with crew who instantly hoisted an aerial and got "crackling" on their R/T.

Needless to say, this sort of thing calls for very comprehensive ground equipment from mobile workshops to mobile flarepaths. The unit is equipped with Mustangs and Lightnings as well as Thunderbolts, which between them combine the duties of interceptor-fighter, escort fighter, fighter-bomber, photographic reconnaissance and "met" observation.

HERE AND THERE

Indicative Straw?

A GERMAN expert in a recent broadcast said that every bomber used by the Allies was a technical masterpiece.

We should not dream of contradicting him, but when Jerry starts saying nice things about us it generally means he knows he is as good as beaten.

Eire Airmail Suspensions

THE Eire Department of Posts and Telegraphs has announced the suspension of airmail services to the Continent of Europe, Algeria, the Azores, Canary Isles, Cape Verde Isles, Libya, Madeira, Morocco and Tunisia.

Airmail services to prisoners of war are also suspended.

Canute in Kingsway

A MEETING held in Kingsway Hall, London, the other day by the Bombing Restriction Committee passed a resolution protesting against bombing. This seems a peculiarly inappropriate moment to choose for trying to stem the tide, and is likely to be about as successful as was Canute's attempt.

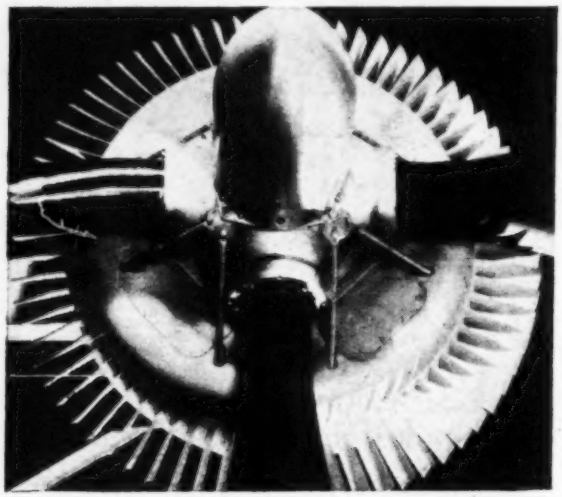
At the end of the meeting a man rose in the body of the hall and protested strongly against the bringing out of the old Socialist bogy by Mr. Rhys Davies, M.P., that money interests brought about this war. "The spirit of Christ," he said, "has gone through our people. The horrible things the Nazis did stirred our people as nothing else has stirred them, and it is an insult to our fighting men and to our people to say that this war is caused by money interests."

Died in Harness

MR. J. T. BROCKHOUSE, chairman and managing director of J. Brockhouse and Co., Ltd., of West Bromwich, Staffs, died suddenly while attending a recent meeting of the S.M.M.T., and the directors of the firm, which was founded by his father in 1886, have prepared and circulated an appreciation of their late chief.

Change of Address

AS from Monday, May 1st, the offices of the Guild of Air Pilots will be removed temporarily to 4, Hamilton Place, W.1. Telephone: Grosvenor 1212. The Guild wishes to acknowledge its indebtedness and to express its gratitude to the Royal Aeronautical Society for providing the accommodation and the increased facilities to members which it affords.



SUPER-COOLER: Increased all-round performance is claimed as a result of this multi-bladed fan mounted direct to the airscrew hub of a Wright Cyclone to augment the airflow. Like that of the B.M.W., it fits just inside the leading edge of the cowling.

Armament Step-up

IT has now been released that the Douglas P-70 night fighter armed with four 20 mm. cannon has six additional machine guns, three 0.3in. and three 0.5in. This makes it one of the most powerfully armed machines in the world. The standard U.S.A.A.F. Havoc carries six 0.5in. guns in the nose and two 0.5in. in the dorsal turret, but no cannon.

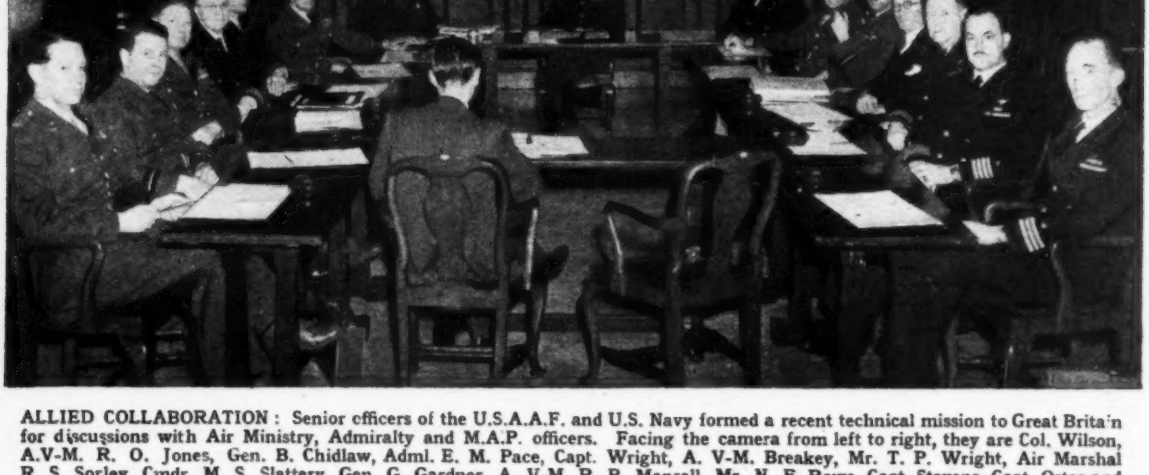
—If Any!

APPLICATION for authority to fly post-war passengers and mail from California to Canton, China, via Tokyo has been filed with C.A.B., by the Ryan School of Aeronautics, of San Diego, Calif. The school also asked for authority to fly a route from Tokyo to Calcutta.

There is, of course, another "school" in America which says there will be no Tokyo after the war!

They'll Soon be Busy

AIR CHIEF MARSHAL SIR RICHARD PIERSE, Air Officer Commanding South-East Asia Command, who recently made an inspection tour of Ceylon, told R.A.F. and R.C.A.F. units stationed on the island: "The enemy is increasing his activities in the Indian



ALLIED COLLABORATION: Senior officers of the U.S.A.A.F. and U.S. Navy formed a recent technical mission to Great Britain for discussions with Air Ministry, Admiralty and M.A.P. officers. Facing the camera from left to right, they are Col. Wilson, A.V-M. R. O. Jones, Gen. B. Chidlaw, Adml. E. M. Pace, Capt. Wright, A. V-M. Breakey, Mr. T. P. Wright, Air Marshal R. S. Sorley, Cmdr. M. S. Slattery, Gen. G. Gardner, A. V-M. R. B. Mansell, Mr. N. E. Rowe, Capt. Stevens, Capt. Oster and Cdr. Russell.

HERE AND THERE

Ocean and the Bay of Bengal. You will soon have plenty to do."

R.A.A.F. Expansion

NOW thirty times greater than at the outbreak of war, the R.A.A.F. increased by 25.3 per cent. during 1943 and is still expanding. The different types of aircraft it uses is still increasing and, so far, it has spent £265,012,000 on maintenance.

These facts were recently given by Mr. A. S. Drakeford, Australian Air Minister, who said that the expansion of the R.A.A.F. continues in spite of 90,000 men being released from the Australian Army.

New U.S.-Brazil Air Line

THE Brazilian Government has approved Eastern Airline's plan for a new air service to South America and a scheme is now being prepared for a new airline to operate a 48-hr. schedule between Brazil and the U.S., said Rio de Janeiro Radio, quoted by Reuter. The plan includes a line from Boston to Rio de Janeiro and thence on to Montevideo.

"Modern four-engined aircraft to carry fifty passengers will be used on these lines," said the announcer, but the actual type was not mentioned.

Tough Guy!

A SOVIET pilot on the Leningrad front, said Moscow radio recently, landed alive and unhurt after baling out with a damaged parachute which failed to open.

This reminds us of a cartoon we recently saw depicting U.S. troops leaping gaily from a Skytrooper without "brollies." To the amazed enquiry of an Important Visitor, the officer in charge of the exercise is replying, "Oh, they're Marines; they say they don't need 'em."

Long, Long Trail

FROM Moscow also comes a story of how Red Army men trekked for five days across the trackless Arctic Tundra to collect two Messerschmitts, complete with Jerry pilots, which had been forced down on a frozen lake after a scrap with Russian aircraft.

The Soviet soldiers drove 100 reindeer, on which they packed the Me's after dismantling them, and brought them safely back with the captured pilots.

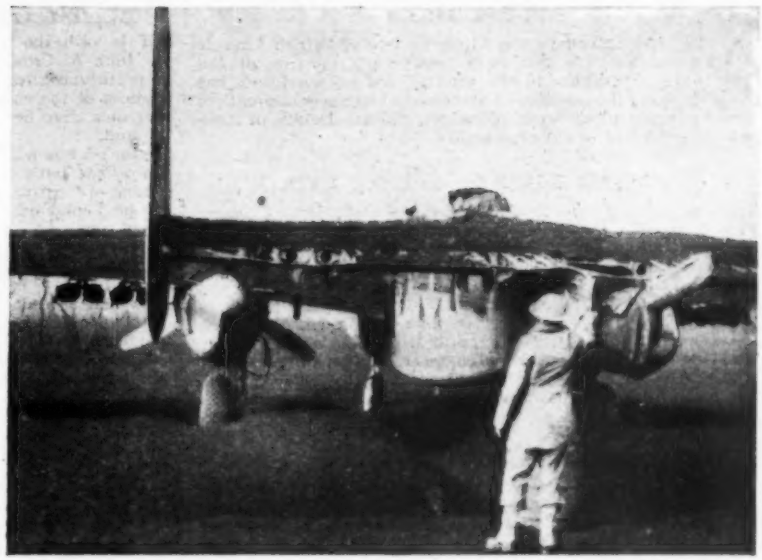
It seems an awful lot of trouble to take, just to get a pair of somewhat bent German fighters, doesn't it?

Learning the Hard Way

AIR Cadets of our Chinese allies learn to fly the hard way; that is to say, within range of marauding Jap fighters and fighter-bombers which often raid their primary training fields.

They have, of necessity, evolved a special air-raid warning system intended to give pupils in the air time to get down before the enemy can reach them, but even so they are sometimes caught at short notice and even if they land safely may have their unarmed trainers "shot up" before they can be safely dispersed.

Incidentally, they use mainly Ryan STM and PT-22 trainers which are shipped to Burma and then flown over the mountains into China, presumably by the Air Transport Command route which entails clearing a 17,000ft. hump.



CARPETED: A Mitchell of the U.S.A.A.F. coated with ashes from Vesuvius. Hot cinders have done considerable damage, some of which can be seen, and the airman examining the aircraft wisely wears a tin hat in case of further eruptions.

Neutralised

ONE of the best stories of the week is probably the one about some Allied bombers which, en route for an enemy target, received an R/T message from the ground that they were over the territory of a certain neutral country.

The commanding officer of the squadron replied, "We know."

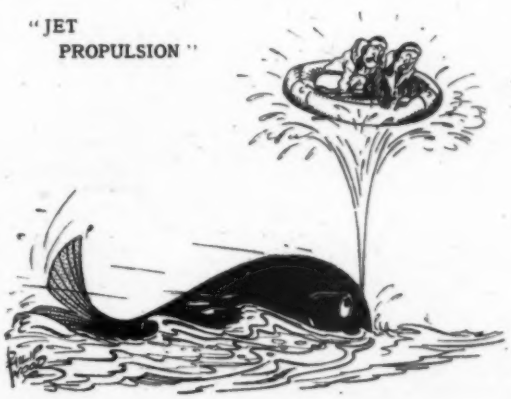
"Unless you change course at once we shall be compelled to open fire" said the neutrals below.

"Yes, we know," replied the squadron commander, and held his course.

Ground defences opened up and ack-ack bursts were seen well below the bombers, so the commander switched on his "mike" again and said: "Your bursts are about 2,000ft. short."

"Yes, we know," replied the neutrals.

"JET PROPULSION"



Loaned to B.B.C.

MR. E. COLSTON SHEPHERD, who was appointed Secretary-General to the Air League of the British Empire on January 1st, 1944, has been seconded for duty to the British Broadcasting Corporation.

Prior to his appointment to the Air League Mr. Shepherd had been for sixteen years a well-known writer on flying and the B.B.C. asked for the loan of his services to act as Air Correspondent during the assault on Europe.

The Executive Committee of the Air League agreed to this urgent request for the temporary use of Mr. Shepherd's valuable services, and appointed Wing Commander P. de L. Dyson-Skinner as Acting Secretary-General. Wing Commander Dyson-Skinner has been a member of the Executive Committee of the Air League for some years.

Great Minds

THE January, 1944, issue of our New York contemporary *Aviation* contains an article by Mr. J. H. Geisse, of the Civil Aeronautics Administration, on a type of undercarriage in which the wheels can be aligned with the runway without the necessity for also aligning the aircraft with the runway, and points out that by this means single flight strips could take the place of expensive airports, and many more towns would be able to provide accommodation close to their centres.

It will be recalled that recently we published an article on the Maclaren drift undercarriage and its advantages, and recalled the first flight trials made in this country before the war, as well as more recent developments carried out by Airwork, Ltd. It is quite on the cards that America may be "sold" on the idea, while we neglect it here in the country of its birth.

APPRENTICES

A SPECIAL sub-committee of the Society of British Aircraft Constructors, formed as a result of a meeting of the apprentice supervisors of the aircraft and engine firms, has been studying the question of aeronautical engineer apprentices and has made a number of recommendations. Details of these will be published in our next issue.

POWER JETS (R. and D.), LTD.

AT a meeting held last Friday the shareholders of Power Jets, Ltd., ratified the agreement by which the Ministry of Aircraft Production takes over the company. The title of the new company will be Power Jets (Research and Development), Ltd. Dr. H. Roxbee Cox becomes chairman and managing director. Other members of the board are Sir William Spanier, Mr. H. R. Ricardo, Mr. Sam H. Brown, Mr. E. N. Plowden, Mr. J. C. B. Tinling, and Mr. R. G. William. Grp. Capt. Whittle will act as chief engineer. On technical matters the board will have the advice of a committee on which will sit heads of the firms engaged on jet propulsion and other gas turbine work.

INDIAN WIND TUNNEL

A NOTE in the January 1944 issue of the Journal of the Indian Council of Scientific and Industrial Research gives the following details of the wind tunnel which is part of the Aerodynamics Laboratory of the Indian Institute of Science at Bangalore.

"The tunnel is of the closed throat-closed return type, and has an elliptical test section 5ft. high, 7ft. wide and 10ft. long. The remainder of the tunnel is 12ft. diameter and is built in reinforced concrete. The tunnel, balance and airscrew were designed and constructed in India, and a 480 h.p. Rolls-Royce 'Kestrel' is used to provide the power. The maximum velocity is 250 m.p.h. and the tunnel has a power factor of 0.21."

DEATH OF JOHN A. CROSBY-WARREN

IT is with the deepest regret that we record the death of John A. Crosby-Warren in a flying accident while testing a prototype aircraft. Little is known of the exact circumstances of the accident, but some reports say that in pulling out of a dive he got into difficulties and half-rolled into the ground.

Our readers will remember him by the articles he has written for *Flight* both under his own name and under the *nom de plume* of "Sparrow." His last contribution was a description of the Typhoon handling qualities. This appeared only a fortnight ago.

He was 33 years old and over 6ft. 8in. in height. This excessive tallness was somewhat of a handicap when fitting himself into single-seater cockpit, and no open machine ever had a windscreen high enough to give sufficient protection. He always had to wear a big Russian fur hat to keep his head warm.

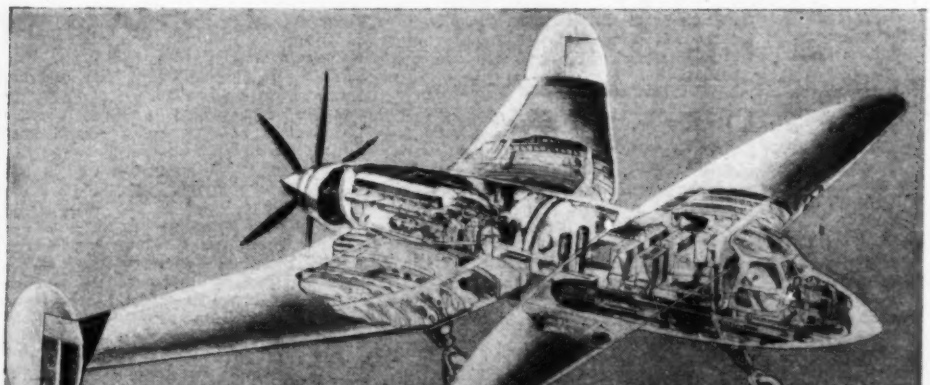
John Crosby-Warren was a Cambridge M.A. and flew with the Cambridge University Squadron. He also served a short apprenticeship with the Bristol Company. His first testing work was with the Parnall Company on their Gipsy-engined trainer, and he was, at the same period, a pilot in the Bristol Squadron of the Auxiliary Air Force.

Just after the Battle of Britain he joined the Gloster Aircraft Company and became one of the senior test pilots of the Hawker Siddeley Aircraft Company's pool of pilots. After much work on Hurricanes he took over the production testing of Typhoons from Michael Daunt and has lately assisted Daunt in flying prototypes and experimental jet-propelled aircraft.

John Crosby-Warren was of the quite exceptional type from which only the very best test pilots are bred. A superb pilot, he could make the flying of a machine like a piece of poetry, yet his technical knowledge was very extensive. His many friends in the Service and in the industry will miss him very much.

J. Y.

MILES TANDEM MONOPLANES



In our issue of August 12th, 1943, we published an article by the Editor recalling certain past experiences with tandem monoplanes, including one with which he was connected in 1911. Here are two "moderns" to show that the type is not dead. The picture on the left shows a project for a Fleet Fighter tandem monoplane, designed by Mr. George Miles in 1941. For a list of advantages claimed readers are referred to the article by Mr. Miles in our April 27th issue. The photograph below is a three-quarter rear view of the Miles "Libellula," M.39 B. experimental tandem. **Other pictures on p. 464.**

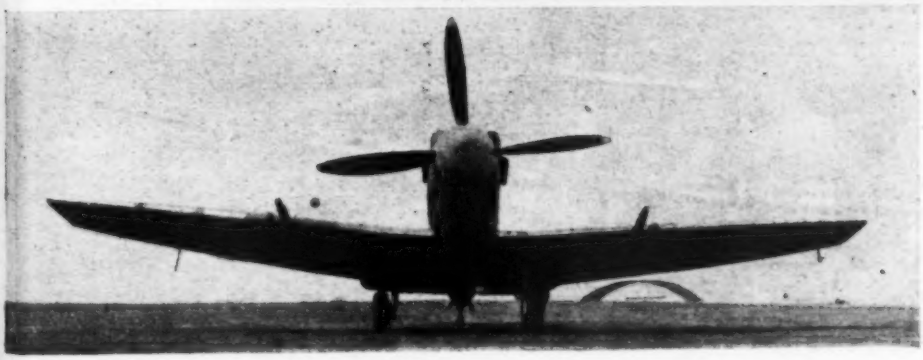
Round the Spitfire XII

Camera Shots Show the New Features of the Latest Version of the Famous Vickers-Supermarine Fighter

From this three-quarter rear aspect the new nose, wing tips and rudder have the most effect on the new Spitfire's outline. It could easily be mistaken for an entirely different aircraft.

The Spitfire is now nine years old but it still looks as modern as its latest competitors. Sleekness has always been the keynote of the Spitfire and this has been preserved in the Mk. XII. The Rolls-Royce Griffon engine and Rotol airscrew fit nicely into the general outline.

Because the wing plan form is shown to some extent in this three-quarter front view taken from a low viewpoint, much of the old Spitfire is apparent. The blanks by the side of the cannon indicate that two cannon per wing can be fitted if the necessity should arise for increased armament.



From the frontal aspect the Mark XII is as clean as its older brothers In common with them, however, it suffers the drawback of having a narrow undercarriage track because of the outward retraction of the wheels.

For spotters the aircraft in the blister hangar is a Tiger Moth.

Behind the Lines

Service and Industrial News from the Inside of Axis and Enemy-occupied Countries

The Flying Dentist

"DENTAL units who fly by special aircraft to wherever they are needed are now operating in German bombed areas," said the German Radio.

Caproni

SERENELY undisturbed by the political collapse of the country, Italy's monster concern, Societa Anonyma Caproni, of Milan, continues to absorb other enterprises in North Italy. Increasing its capital from twenty to twenty-five million lire, the Caproni is now reported to have acquired the *S.A. "Avio" Industrie Stabiense Cantello Coppola*, of Castella-Mare di Stabia, bringing its list of subsidiary companies to twenty.

Secret Research

EXPERIMENTS with a rocket (or jet?) propelled aircraft, controlled from the ground by wireless, are said to be conducted by the Germans on the island of Bornholm.

Starting with model aircraft and recently going over to full-size types, the Germans were reported to have little luck with their experiments: several aircraft have been seen crashing to the ground, one causing a violent explosion which damaged farm buildings in the neighbourhood.

High-altitude Glass

NON-CRACK, splinter-proof, pressure-resistant, unbreakable safety glass ten times tougher than the normal type of safety glass used in motor cars is said to have been developed by German scientific laboratories.

Interleaved with laminations of synthetic resin the new glass is to be chiefly used for cockpits of high-altitude aircraft and pressure cabins for which the panes are being so designed that the pressure inside the cabin would not decrease even when the glass is cracked.

Luftwaffe Shy

AFTER the German News Agency had reported attacks on targets on the south-western coast with good results, the German Overseas News Agency made this comment: "The report is interesting in view of the Anglo-American invasion preparations. No details are available at this moment as to the character of the attacked targets or their location."

BV 222

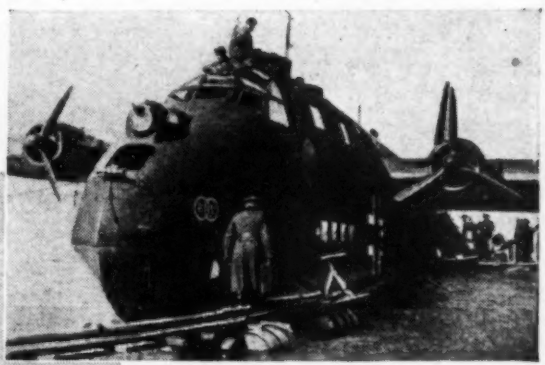
GERMANY'S latest flying boat and *Luftwaffe's* largest aircraft, the six-engined BV222, was originally designed by the Blohm and Voss before the war for a proposed trans-Atlantic service of the Lufthansa. Although the prototype crashed in 1940, a military version was developed and was reported first in service in the latter part of 1942, when one of these types was shot down between Italy and North Africa.

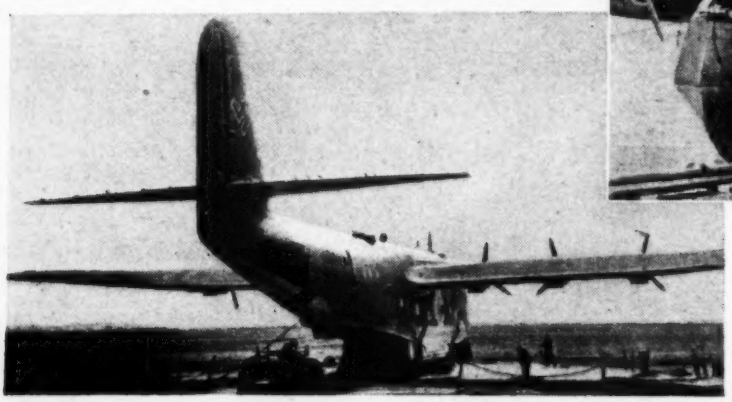
Somewhat resembling the Short Empire flying boat, the BV 222 "Viking" has a span of 151ft., a length of 121ft. 4in., and a height of 18ft. 4in. The wings have a wide centre section with outer panels tapered slightly to broad, slightly rounded tips. Single fin and rudder with a broad, rounded apex; the tailplane which tapers mostly on the leading edge and has small square tips is mounted a short distance up the fin.

The upper part of the hull contains a spacious cockpit, navigator's bridge and engine control room, while the lower deck accommodates 100 fully armed men or a similar weight of freight.

Two versions of the Viking are being produced: one powered with BMW 323 985 h.p. air-cooled radials with two-speed superchargers and direct fuel injection, the other with Junkers 207 diesels.

The defensive armament of the flying boat is said to be composed of "numerous cannons and machine guns."





NEW ASPECTS OF THE BV 222 "VIKING": (Above) The hull consists of two decks, the lower accommodating 100 fully armed men or an equivalent weight of freight, the upper, the cockpit, navigator's bridge and engine control room. (Left) Three-quarter rear view showing the hull formation and tail unit. (Below) Front view of the Viking in flight.

An impressive line of Fortresses newly arrived from the States and awaiting their turn for modification at a U.S. Air Service Command base.

Flying Fortress

(B-17G)

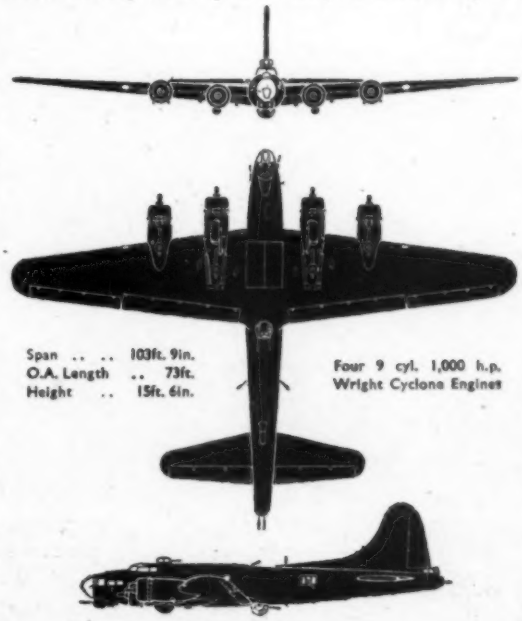
A Survey of the Hard-hitting American Heavyweight : Eighth of the Fortress Line and Fifth to See War Action

THE founder of the Fortress family was born in 1935 and was known by the number 299; it was a pretty large machine for those years and, moreover, one which made a record-breaking maiden voyage by flying non-stop the 2,100 miles between Seattle and Dayton, Ohio. This aircraft was followed, some little time later, by 13 others, the first to bear the designation B-17, and these were delivered to the U.S.A.A.C. between January and July, 1937.

Next came the B-17A, an experimental model which, by the employment of turbo-supercharged engines, laid the foundations for high-altitude bombing. The turbo-blowers, of which more later, enable the engines to give high power output when operating in conditions of reduced atmospheric density. After the "A" came a total of 39 B-17Bs, which were delivered by March, 1940, and these were followed by the "C" model on which the armament was greatly improved. These 17Cs were, incidentally, the first of the breed to see genuine war action, the Royal Air Force using them for the first time in 1941, but even with their improved armament, they were not up to matching the punishment handed out to them by the enemy, and they suffered rather heavily.

The successor to the "C" was the B-17D, a total of 42 of which were delivered by September, 1941. The "Ds" were the first Fortresses to be equipped with leakproof fuel tanks. It should be pointed out that the Flying Fortress was originally conceived as a defensive aircraft, and the complete range of models "A" to "D" inclusive were, literally, peacetime military types designed for long range, or euphuistically "hemisphere" defence. Despite the fact that the historic *débâcle* of Pearl Harbour came as a complete surprise to the mass of the Americas, the Boeing Company was completely retooled for production of the first real war model Fortress, the B-17E, a year prior to the Pearl Harbour incident, although it must be mentioned that a great deal of the air fighting in the first few weeks of the Pacific battles was done by the "D" models.

Fortresses of the "A to D" group were known collectively in this country under the heading of Fortress I, and the introduction of the "E" caused this model to be known here as the Fortress II. Many modifications were incorporated in the "E"; the fuselage was lengthened by over five feet; tail guns and power turrets, including the spherical ventral turret, were introduced; the now familiar spine fillet to the fin appeared, and the area of the tailplane was enlarged by increasing its span. In addition, the equipment of the machine was generally modernised throughout. The Fortress I scaled 40,000 lb., and the Fortress II 50,000 lb., the added weight making an increase in fin and tailplane area necessary. Following the "E" model came the B-17F, which was in production for a period of 15 months; these "F" Forts have done some really grand work, and their ranks are now steadily being swelled by the latest of the Fortress line, the B-17G, which, by introducing



Span .. .. 103ft. 9in.
O.A. Length .. 73ft.
Height .. 15ft. 6in.

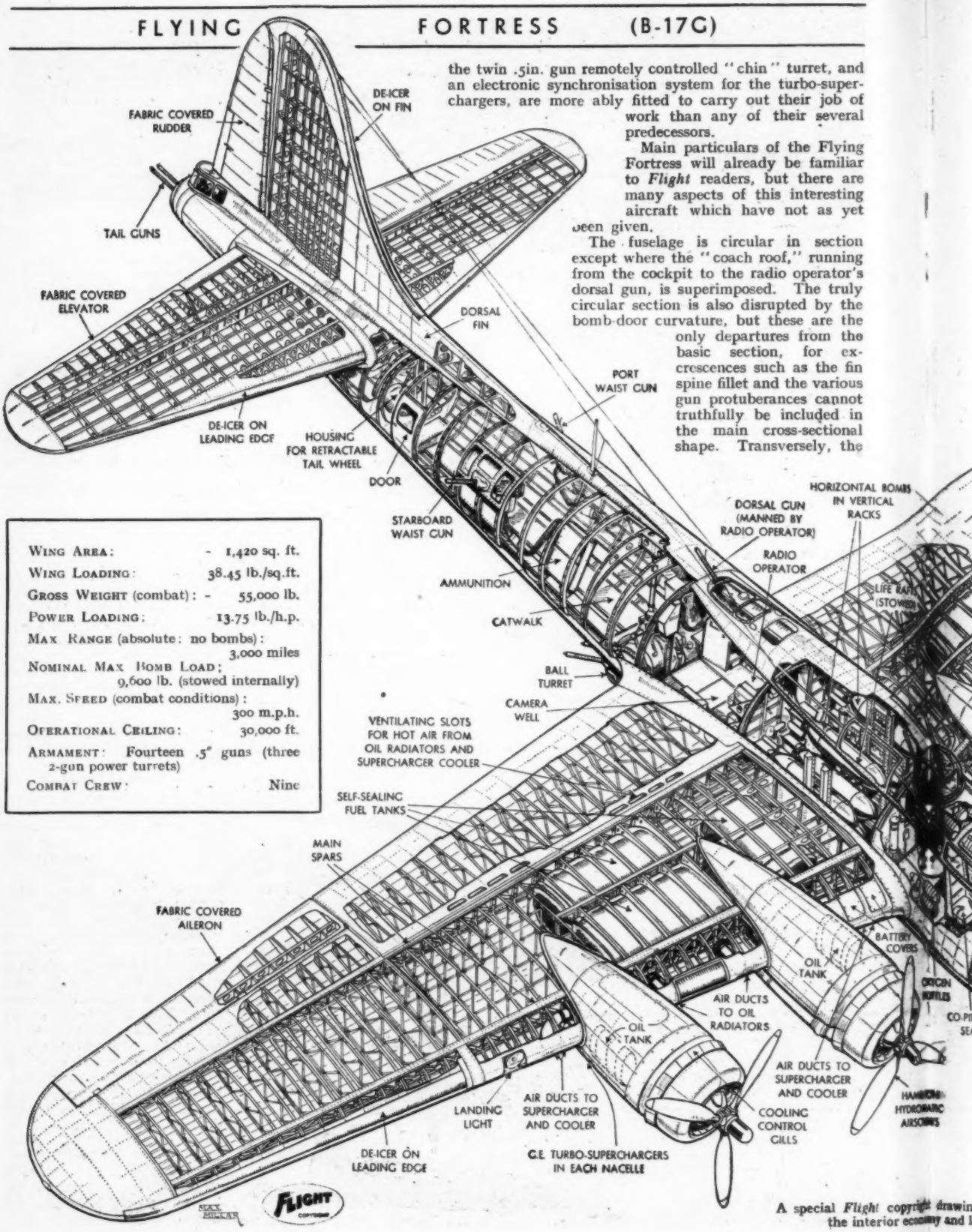
Four 9 cyl. 1,000 h.p. Wright Cyclone Engines

FLYING FORTRESS (B-17G)

the twin .5in. gun remotely controlled "chin" turret, and an electronic synchronisation system for the turbo-superchargers, are more ably fitted to carry out their job of work than any of their several predecessors.

Main particulars of the Flying Fortress will already be familiar to *Flight* readers, but there are many aspects of this interesting aircraft which have not as yet been given.

The fuselage is circular in section except where the "coach roof," running from the cockpit to the radio operator's dorsal gun, is superimposed. The truly circular section is also disrupted by the bomb-door curvature, but these are the only departures from the basic section, for excrescences such as the fin spine fillet and the various gun protuberances cannot truthfully be included in the main cross-sectional shape. Transversely, the



WING AREA:	1,420 sq. ft.
WING LOADING:	38.45 lb./sq.ft.
GROSS WEIGHT (combat):	55,000 lb.
POWER LOADING:	13.75 lb./h.p.
MAX RANGE (absolute: no bombs):	3,000 miles
NOMINAL MAX BOMB LOAD;	9,600 lb. (stowed internally)
MAX. SPEED (combat conditions):	300 m.p.h.
OPERATIONAL CEILING:	30,000 ft.
ARMAMENT:	Fourteen .5" guns (three 2-gun power turrets)
COMBAT CREW:	Nine

A special *Flight* copyright drawin
the interior economy and

fuselage is divided into three major parts, the foremost running from the nose to the forward bulkhead beneath the pilots' windscreen; the central section runs to the bulkhead which forms the aftermost wall of the radio compartment, and the rear section from these to the tail gun emplacement.

For the purposes of description, however, the fuselage is best visualised as being divided into seven portions from the nose aft, these being respectively: (1) bombardier's and navigator's compartment with rear hatchway leading (above) to (2) pilots' cabin, behind the seats of which are situated the oxygen bottles and the upper, power-operated two-gun turret. (3) Bomb-bay with life-rafts stowage and cat-walk between racks to (4) Radio compartment. (5) Main rear cabin containing ventral power-turret, emergency flotation radio set and aerial kite, waist gun emplacements, and main entry door on starboard side aft. (6) Compartment housing retractable tail-wheel and automatic pilot stabiliser, and (7) Tail gun position beneath rudder.

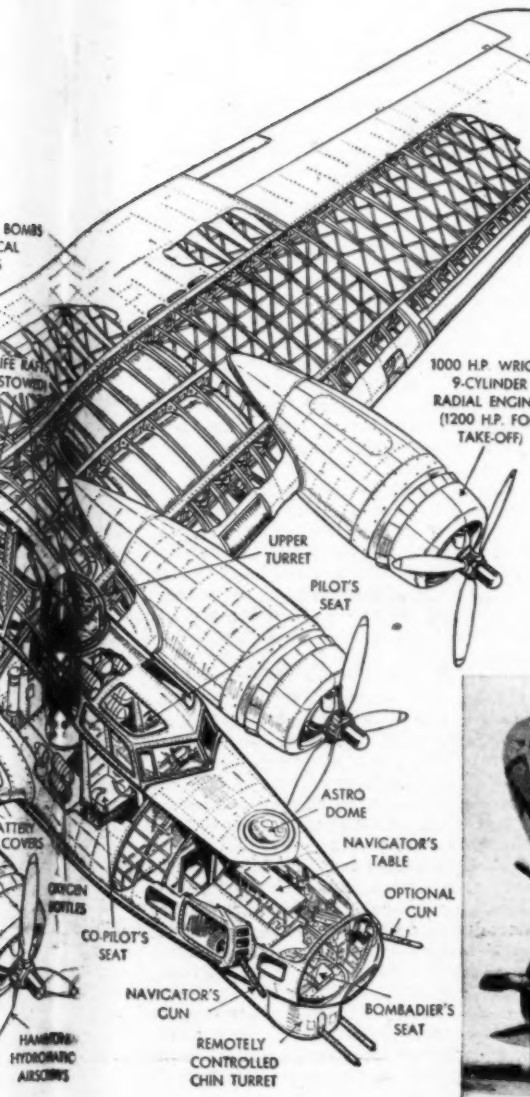
To go back to the nose of the aircraft, the actual nose cap is a plastic, single-piece moulding into which is fitted the bombardier's optically flat aiming panel. In contrast to the R.A.F. bomb aimers, or more correctly, air-bombers, their American counterparts sit on a little stool to operate the far-famed bombsight. There are four .5in. calibre guns in the nose of the Fortress, two in the remotely controlled chin turret immediately beneath the bombardier/front gunner's seat; one optional gun universally mounted to port behind the edge of the plastic nose cap, and another gun, usually operated by the navigator, housed in a small projection to starboard farther aft. The navigator can operate either of these single guns according to the calls of immediate circumstance.

The stool on which the bombardier/front gunner sits is mounted above the pivot housing for the lateral rotation of the chin turret, the transverse motor for the turret being fitted at "8 o'clock" behind the stool. The remote controls for operation of the turret and its guns are mounted on a tubular bracket, normally clipped out of the way to starboard, and swung into a central position for operation. The twin hand grips are "dead-man's handles" having small inserts which, when depressed, make an electrical contact in the turret operation circuit; these handles have a modified gimbal pivotal arrangement, their movement controlling the relative movement of turret and guns, and also the simultaneous registered movement of the reflector sight which is mounted in the top portion of the nose cap.

Compact Cockpit

A navigator's chart table is mounted fore and aft on the port side of the nose compartment, with the various radio impedimenta above his left shoulder on the port side of the bulkhead. Behind the navigator to starboard is his drift meter, and centrally fitted in the roof is a flattened astro dome. Through the rear hatchway (on one's hands and knees) going through to the pilots' "office," there is an escape hatch to one's right, the door of which is jettisonable. The entry from the nose compartment to the pilots' cabin is up through a folding trap in the floor between, and a little behind, the pilots' seats.

The cockpit of the Fortress gives one an immediate impression of being compactly self-contained. These aircraft are operated by two pilots, the chief sitting to port and the co-pilot to starboard, visibility for each being good: shoulder room, however, is not exactly ample, for the sloping side windows come into contact with one's "outer" shoulder even when ordinarily clothed, and when wearing



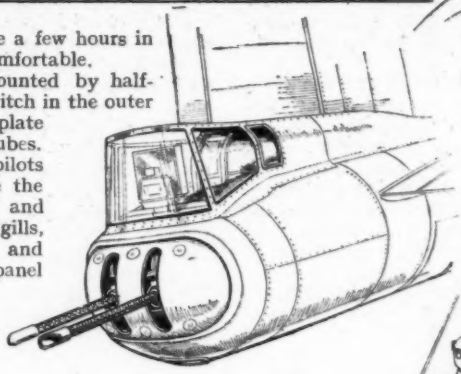
copyright drawing by Max A. Millar which reveals or economy and layout of the Flying Fortress

B-17Gs at an A.S.C. base being prepared for flight testing after modifications have been made. The chin turret and modified nose are clearly shown

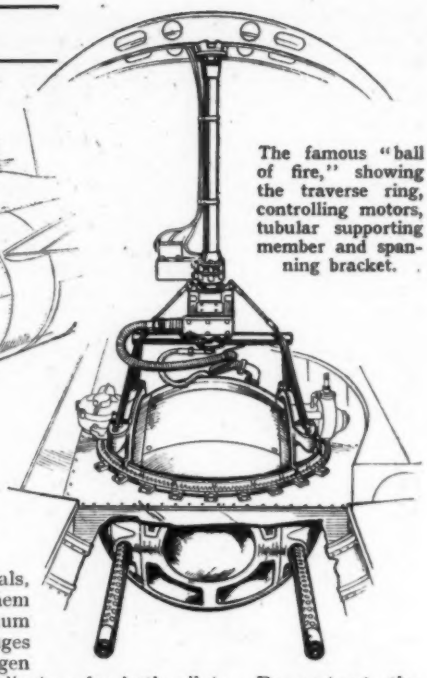
FLYING FORTRESS (B-17G)

bulky flying clothes one can imagine a few hours in either of these seats becoming uncomfortable.

Twin control columns are surmounted by half-wheels with a microphone button switch in the outer "horn" tip. Rudder control is by plate type pedals suspended from torque tubes. Centrally mounted between the two pilots is a pedestal, on top of which are the switches for fuel shut-off valves and booster pumps, lights, cooling gills, undercarriage, flaps, landing lights and engine ignition. At the rear of this panel are the mixture controls and the throttles, and behind these and a little below, the airscrew pitch controls: all these lever controls are provided with separate friction locks. Elevator and rudder trim wheels are at the base of the pedestal to the left and rear respectively, whilst the control panel for the automatic pilot is mounted below the airscrew pitch controls. Pull-up levers, countersunk in the floor between the pilots' seats, actuate ground or parking locks for rudder and elevators (left lever) and tail wheel (right lever). Aileron locking is by a removable pin which anchors the half-wheels secure from movement to the control column.



This sketch shows the latest type tail gun emplacement; the gunner's bullet-proof optical flat panel and reflector sight may be seen. His entry door is beneath the starboard elevator.



The famous "ball of fire," showing the traverse ring, controlling motors, tubular supporting member and spanning bracket.

Instrument Layout

The instrument panel, or panels, are neatly laid out but the scarcity of dials facing the chief pilot, and the close grouping of dials facing the co-pilot, seem strange to English eyes. The blind-flying panel—which includes a blind-approach indicator in addition to the six normal instruments found on standardised British b.f. panels—is mounted between the two pilots, slightly off-set to the left. Beneath this panel are arranged the four airscrew feathering knobs.

Before the chief pilot are the radio compass and D.R. compass dials, and below them oil and vacuum pressure gauges and the oxygen gauges and indicators for both pilots. By contrast, the co-pilot has on his panel, all the engine instruments—boost, r.p.m., cylinder head temperature, carburettor air intake, fuel pressure, oil pressure and temperature, air temperature, and fuel gauges. In addition to these, he also has the carburettor air filter switches (the filter is used up to 15,000ft.) and indicator lights; engine starter switches; intercooler temperature control levers and engine primer pump. Should the normal hydraulic power pumps get damaged or go u/s, the co-pilot also has to work the hydraulic emergency hand pump.

In the roof, at the apex of the windscreen V, are mounted an 8-day clock, a sphere-type compass and the de-icing pressure indicator. Behind these in the centre of the roof between the pilots are the radio selector controls, etc. Each pilot's seat has a complete back panel of armour plate extending from the seat itself to the level of the top of the pilot's head.

The ball turret gunner in place. The reflector sight and ammunition feed for the guns are shown. The whole central portion of the ball may be rotated in a vertical plane, the "cheeks" (at each side) remaining stationary. *(By courtesy of "Life")*

Portable Oxygen Systems

Behind the pilots' seats are mounted eight large oxygen bottles—three on starboard side, five on port side—and a further 10 similar bottles beneath the floor. Four separate oxygen systems are provided, operating at a normal pressure of 350 lb./sq. in., each system supplying a portion of the crew; thus damage to one system, in combat for instance, does not affect the others. In addition to the main supply, to enable him to move about, each crew member has his own small emergency oxygen bottle which has a duration of 2½ hours at 30,000 feet, and can be refilled from the main system. These type bottles are fitted in the gun turrets.

The upper turret is stationed behind the pilots, and the gunner is treated a little more favourably in the Fortress II than he was in previous types, for whereas he used to have to stand in a pair of stirrups to operate his turret, he now sits more or less comfortably in a padded, webbing sling. The twin .5s are mounted wide apart and their ammunition is fed from six metal boxes, three on each side, mounted beneath the guns, and rotating with the turret. The guns and reflector sight move

FLYING FORTRESS (B-17G)

sympathetically, actuation and firing being by a pair of "dead man's handles" similar to the chin turret arrangement. The upper turret rotates on a massive ring assembly and is anchored by two stout tubular members which converge on to a rotatable plate set in the fuselage floor; adjustable foot rests for the gunner are mounted on each of these supports.

Almost as different from that in British aircraft as it well could be is the bomb compartment of the Fortress. Bombs are housed horizontally side-by-side and stacked vertically in two tiers on either side of the narrow catwalk which affords passage through the compartment. The catwalk is on top of a massive Warren-type girder which acts as a spine to the fore and aft transverse bracings; at the outboard sides of the bomb bay are longitudinal girders which, together with the spine girder and the transverse braces make a rigid "two-bay" centre section to which the front and rear wing spar pick-up points are attached. The bomb doors are operated electrically, each door having a fore and aft screw jack rotated by a reversible motor beneath the forward end of the catwalk, with torsion shafts to the rear screw jacks. The transfer valves for fuel tanks are mounted on the after bomb compartment bulkhead.

The Radio Compartment

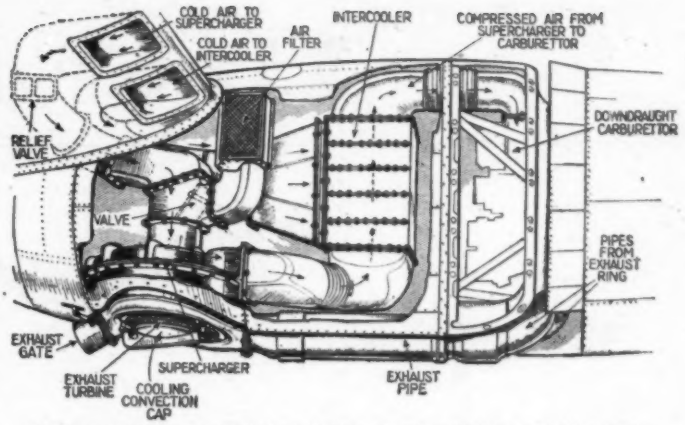
At the rear of the bomb bay, as mentioned previously, is the radio compartment with the operator's table to port against the forward bulkhead. On all the walls of this station is mounted the multifarious and complicated equipment which is so necessary to present-day operations, whilst in the floor is the camera well. The radio operator's dorsal gun is now mounted permanently in a gimbal pivot with a preloading spring for vertical movement. Previously, this gun was slung on rails and brought into use by opening a panel and sliding the gun forward. This arrangement caused severe losses to Fortress radio operator/gunners through frostbite and kindred attacks, and there can be no doubt that the present installation is far more comfortable and, consequently, of greater defensive value. This gun, incidentally, has a surprisingly large field of fire, and is fed with ammuntion from a box mounted on the starboard side of the after bulkhead.

A door with a mesh window gives access from the radio room into the main rear cabin, and immediately through the doorway, the ball ventral turret projects about quarter of its bulk through the floor.

Ball Turret

The ventral turret is suspended by a tubular member anchored to a spine box between two reinforced formers, and this suspensory member terminates in a spanning bracket. Traversing is done against an internally toothed ring mounted in the floor, and elevating or depressing is transmitted through toothed segments set normally to the traverse ring. The gunner cannot enter this turret from the interior of the machine if on the ground as there is insufficient clearance for the gun muzzles when the guns are vertical—the only position in which the turret door is accessible from inside the fuselage. When inside the turret, the gunner is virtually sitting "on the back of his neck" with his knees and feet level with his head. This attitude, although somewhat embryonic, allows the gunner a good view between his legs and, apparently, in no way detracts from the efficacy of his shooting judging from some of the scores obtained. Ammunition for the guns is carried inside the turret.

To the rear of the ball turret, and to starboard, is carried the emergency flotation radio set and box kite aerial—the life rafts are stowed in emplacements at the forward upper part of the bomb compartment, accessible from outside—



Turbo-supercharger nacelle installation, showing airflow paths for aspiration and charge cooling. The cooling airflow through the intercooler is exhausted through vents in the upper surface of the wing behind each nacelle.

and to port is the trailing aerial drum and winch.

Maker's Individuality

The waist guns are opposite one another in some Forts, and offset fore and aft in others; it depends on the firm making the machine. Likewise, some waist guns are mounted at the base of large, single-piece windows, whilst others have "framed" windows. As with the radio operator's gun, the permanent fixture of the waist guns, without the necessity for open-firing panels as in previous models of the Fortress, contributes in large measure to the bodily well-being of the gunners and, therefore, their efficiency. Large panels of armour plate are fitted beneath each gun, and the firing steps are covered with a special "non-slip" composition.

A massive two-part framework forms the after end of the main rear cabin. This takes the major loading of the tail wheel. The tail wheel retracts into a sheet metal cowl above which is mounted the automatic pilot stabiliser. Further aft, to starboard, is the small entry door for the tail gunner—this saves him crawling through the confined and restricted space just mentioned—and right at the tail, beneath the rudder and of surprisingly roomy size, is the tail gun emplacement.

The tail gunner half kneels, half sits to do his stuff, having knee and shin pads and a little bicycle-type saddle. He has a very fine field of view almost all round him and a small window panel on his left can be opened if he so desires. The guns are directly controlled, being mounted in a large gimbal type pivot, and the reflector sight, with its bullet-proof, optical flat panel, is registered with the guns for movement. Large slabs of armour plate are fitted inside the face of the spherical cowling, and the whole layout of the tail-gun emplacement in the 17G is an improvement on the preceding types.

Structurally, the Flying Fortress is an orthodox stressed-skin aircraft. The fuselage frames are circular Z-section members to which are attached beaded L-section extruded stringers, and this arrangement prevails except at one or two points such as the ball turret station and the tail-wheel station, where reinforced frames are fitted, as shown in the cut-away drawing. There are but four bulkheads, as such, these dividing and enclosing the four main front compartments.

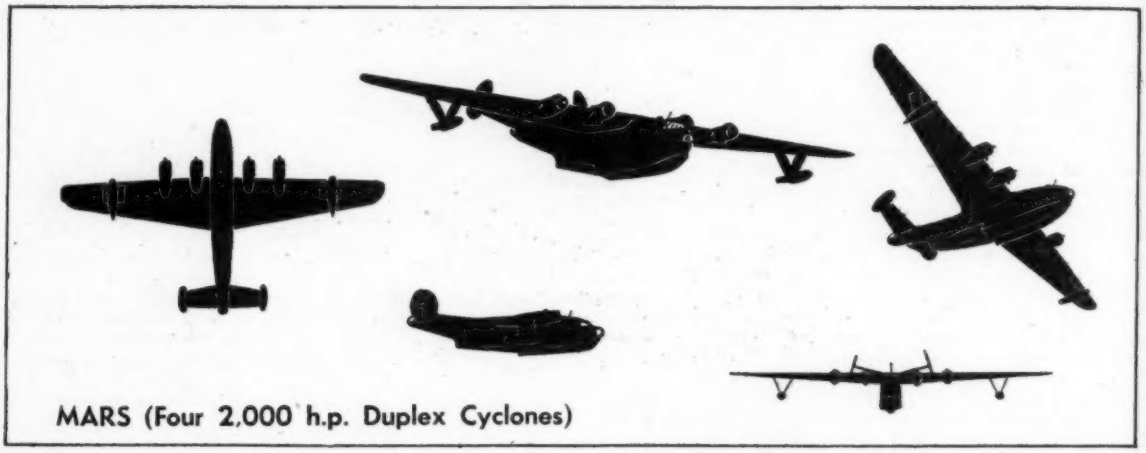
The spine fillet to the fin is built up of pressed stiffeners, to which are attached the covering skin panels, and carries on its leading edge a rubber de-icing overshoe. The structure of the fin itself consists of horizontal pressed-sheet formers or ribs with vertical stringers to which are attached the skin panels. The rudder is a fabric-covered structure.

Front and rear spars of the tailplane are truss-type structures to which are attached pressed-sheet ribs, the

(*Continued on p.* 486.)

Studies in Recognition

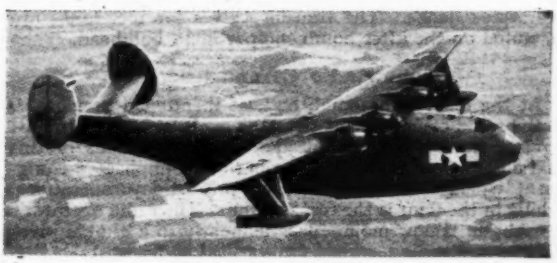
Aircraft in Fl



MARS (Four 2,000 h.p. Duplex Cyclones)

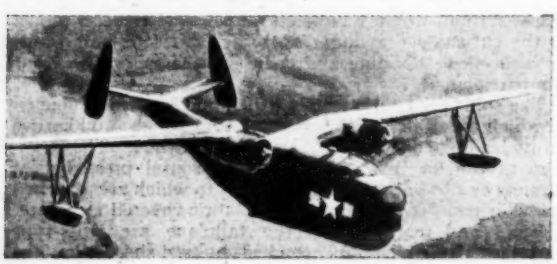
ORIGINALLY intended to be a "flying battleship" the Martin flying boat *Mars* is a prototype which Glenn Martin himself said was becoming obsolescent when Henry Kaiser wanted to mass-produce the type in his shipyards. It has now been converted into a transport for the U.S. Navy and has been busy lately beating its own load-carrying records.

Powered by four 2,000 h.p. Wright Duplex Cyclones, the *Mars* is really a development of the Mariner (below) to which it bears a certain family likeness, especially in the upswept stern of the hull and dihedral tailplane. But its enormous size makes its radial engines look like thimbles. Its wings taper on the trailing edge and have no visible dihedral; twin endplate fins and rudders are oval and the slab-sided hull is very deep. Dimensions: Span 200ft., length 117ft., height 36ft., wing area 2,350 sq. ft.



Martin *Mars*, U.S. Navy Transport.

MARINER (Two 2,000 h.p. Duplex Cyclones)

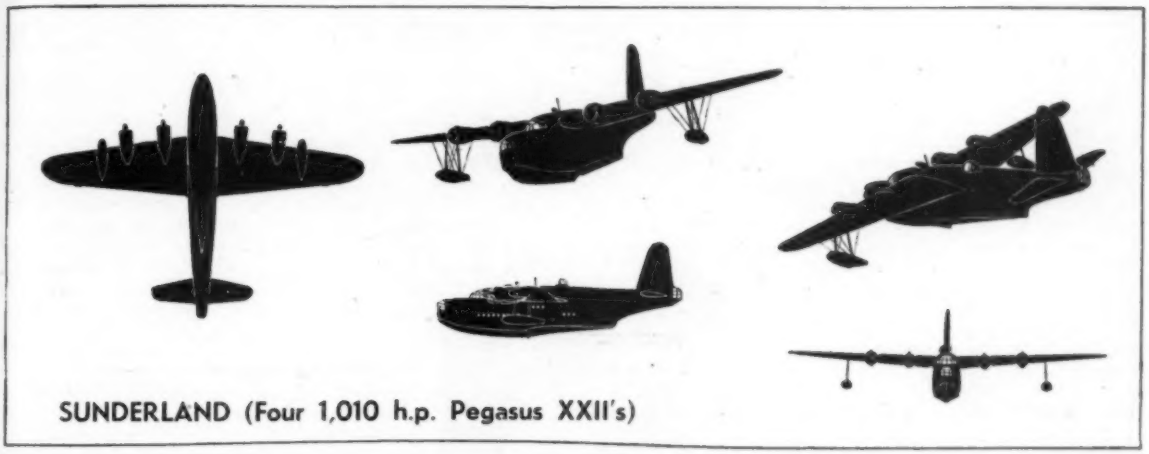


Martin Mariner PMB Patrol Bomber.

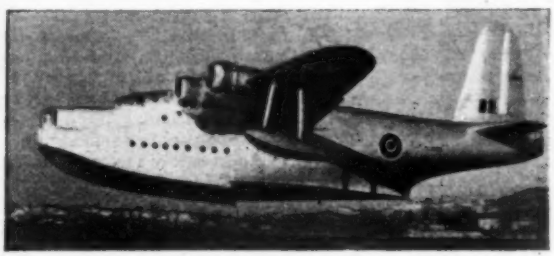
THE Martin Mariner PMB patrol-bomber is powered by a pair of 2,000 h.p. Wright Duplex Cyclones and has a top speed of about 225 m.p.h. It has power-operated nose, tail and dorsal gun-turrets, waist guns, and carries two 22in. torpedoes or the equivalent bomb-load under its wings.

The gulled wing, which tapers almost wholly on the trailing edge to small, round tips, forms its chief recognition feature, together with the acute dihedral angle of the tailplane. The latter has parallel edges and carries twin endplate fins and rudders of high-aspect ratio which, being set at right angles to the tailplane as on the *Mars*, are inclined inwards in relation to the vertical axis of the aircraft. Fixed stabilising floats are fitted, though earlier versions had the retractable kind. Dimensions: Span 118ft., length 77ft. 2in., height 17ft. 6in., wing area 1,330 sq. ft.

Flying Attitudes



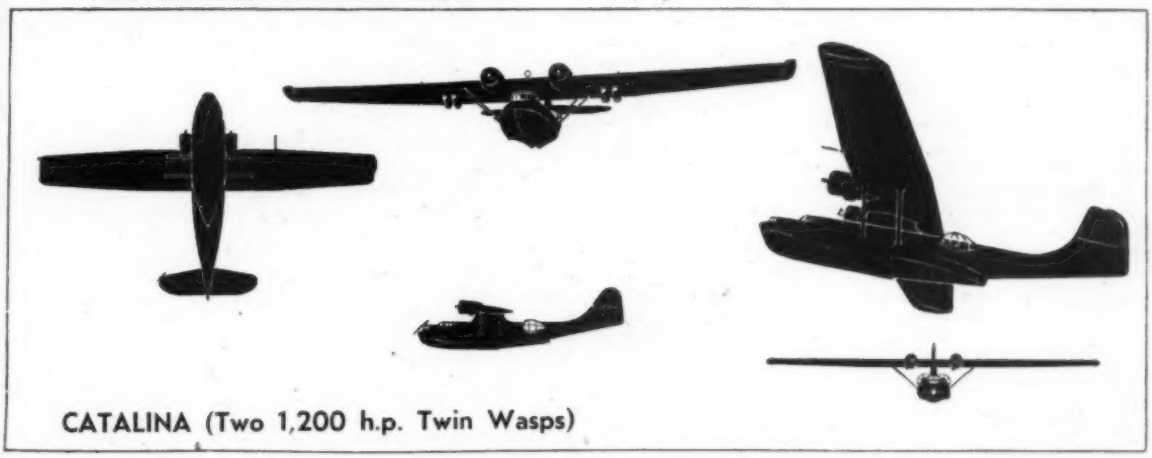
SUNDERLAND (Four 1,010 h.p. Pegasus XXII's)



Short Sunderland Reconnaissance Bomber.

WHEN Coastal Command badly needed flying boats during the pre-war R.A.F. expansion programme, the Short "C" class Empire flying boat lent itself admirably to military conversion and the result was the Sunderland. The latest version to which reference may be made, the Sunderland III, differs only in a few details from the Sunderland I, including the addition of a power-operated dorsal gun-turret.

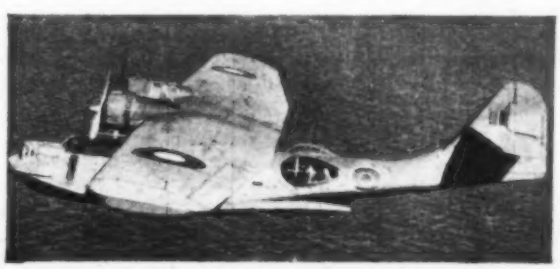
Powered by four 1,010 h.p. Bristol Pegasus XXII air-cooled radial engines, the Sunderland has a top speed of just over 200 m.p.h., and a maximum range of well over 2,000 miles. Wings and tailplane taper symmetrically to small tips and the single fin and rudder is tall. The hull is deep and slab-sided and fixed wing floats are fitted. Dimensions: Span 112ft. 9in., length 85ft. 4in., height 32ft. 10in., wing area 1,687 sq. ft.



CATALINA (Two 1,200 h.p. Twin Wasps)

DESIGNED specifically as a reconnaissance flying boat in 1935, the Consolidated Catalina is notable for its enormous range of some 4,000 miles or patrols of more than 20 hours' duration. A tricycle amphibious version, the Catalina III PBY-5A, is also in service. Power is provided by two 1,200 h.p. Pratt and Whitney Twin Wasps and top speed is 190 m.p.h.

The strut-braced pedestal wing has a wide, flat, rectangular centre-section and the engines are mounted close together above the shallow hull. The outer panels of the wings taper slightly, the retractable stabilising floats forming square tips. The cantilever tailplane, tapered on its leading edge, is set half-way up the large single fin and rudder. Large gun-blisters are situated amidships, and there are other guns in the nose and beneath the tail. Dimensions: Span 104ft., length 62ft. 2in., height 18ft. 6in., wing area 1,400 sq. ft.



Consolidated Catalina PBY Patrol Bomber.

Future of Civil Aviation

Second Part of Sir Roy Fedden's Cantor Lecture Read Before the Royal Society of Arts

THE initial part of this year's Cantor Lecture to the Royal Society of Arts was reported in last week's issue of *Flight* and the following are abstracts of the concluding sections of Sir Roy Fedden's paper.

Sir Roy expressed the opinion that civil aviation design and development will be an engrossing occupation during the next 15 years, and if the younger generation of aircraft engineers and designers can show boldness and be prepared to proceed quickly but wisely there will be an absorbing future in the industry. He emphasised the necessity for specialisation in the design of new civil aircraft types, and said that for the first five years after the war, civil aircraft engineers must work faster than they have ever done before, for whereas a type planned to fly in three or four years' time always appears to be the last word, it never is by the time it is actually flying

On the subject of structure/weight percentages, Sir Roy said that contrary to expectation structure weights have remained surprisingly constant, and the accompanying graph shows average curves for what has been achieved for large aircraft.

Sir Roy Fedden.

All-Wing Aircraft Likely

It was Sir Roy's belief that the first post-war civil transport must be of normal design, and probably several of the second series as well. As even the best contemporary designs have far too much parasitic drag, it is of prime importance that every effort be made to improve the pay load of future types by reducing both drag and structure weight. Higher wing loadings and operation at higher altitudes are likely to precede what may be the logical outcome of research investigations, the all-wing or tailless aircraft. Considerably improved methods of manufacture and finish are required for wings and airscrews, and the anticipated reduction in drag may be further improved by the successful realisation of boundary layer control.

"The view has been expressed," said Sir Roy, "that after the war we in this country will have to use American civil aircraft. While it is appreciated how good these machines are, and that certain types are ahead of anything we possess, it is essential that we should get down to building our own equipment as quickly as possible, even if it may at first be somewhat obsolete technically. Provided always that they are as safe as anything existing at the time, it is suggested that the right policy is for us to use our modified military types wherever possible."

Sir Roy went on to say that it is obvious that we shall have to start the race for international civil aviation as back markers, and it is only by straining every nerve, and employing the wisest and most careful planning that there is any chance of our coming to the front within a reasonable time after the war. He believed it is possible for us to do so if we are fast enough, if we plan wisely on a technical aspect, having regard to the limited engineering and design resources of our industry, and if some firms are allotted short-term development while others are started on long-term, really advanced custom-built types. For air liners of 50,000 to 100,000 lb. all-up weight, at present it normally takes from three to five years to design develop and get a machine into a sufficiently good state to maintain a service on the highest safety factor. For the larger types of machine, the time required will be longer.

Sir Roy suggested, therefore, that during our first five-year period, when we have so much to catch up, we should concentrate on a few types of modest size, which can be realised and put into service quickly. This should provide a breathing space, while we launch out into entirely new types for the subsequent period, making use of the great technical developments which we believe are round the corner.

Importance of Experimental Work

During this first five-year period, it is of vital importance also to tackle the basic experimental work that will make the new and more ambitious types possible. What is so vitally necessary is to gain much more knowledge of the various devices, which can be employed to achieve improved range and pay load, such as laminar flow wings, lowest specific consumption, pusher airscrews and completely buried and ducted power plants. The inevitable answer would seem to be a change to the tailless type of machine.

Sir Roy went on to say, "With the tailless type, the larger the machine, the less will be the body size needed, but for passenger aircraft of this type, especially in the smaller sizes, it would appear necessary for some form of body to be provided in order to give passengers adequate view. With machines in excess of 80,000 lb., the wing

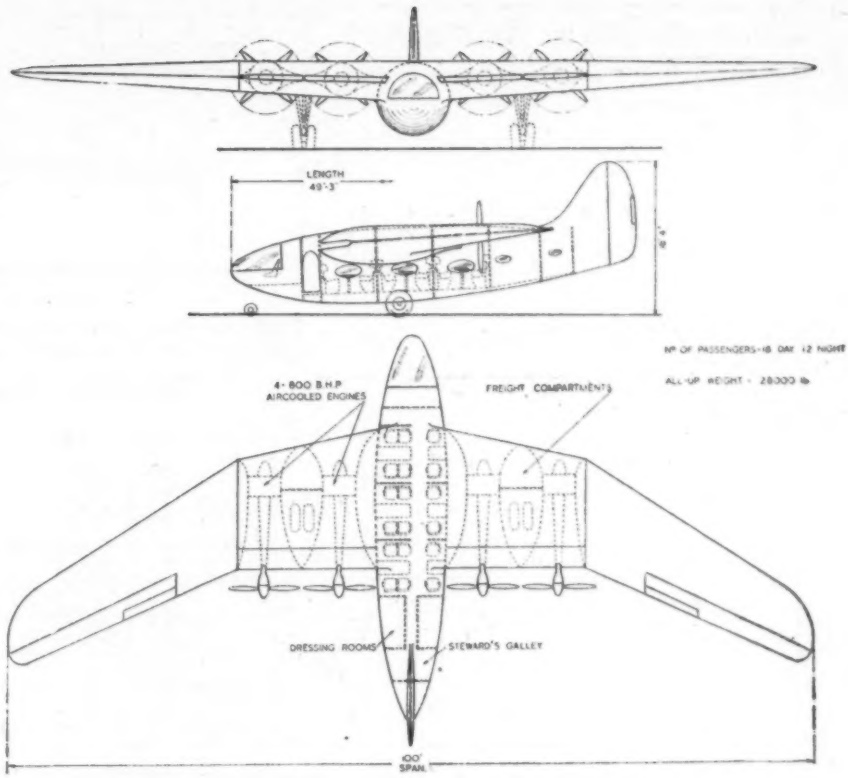
	Type	Engines	Total Take-off Power	All up Weight	Power Loading	Useful Pay-load	Number of passengers	Normal Operating Height	Range in Still Air	Cruising Speed at Normal Op. Height
				lb.	lb./b.p.	lb.		feet	miles	m.p.h.
BRITISH	Vickers Warwick	2 Double Wasp	4,000	45,000	11.25	7,600	34	10,000	1,000	225
BRITISH	Handley Page Halifax Conversion	4 Hercules	6,400	63,000	9.8	4,000	34	10,000	2,000	200
BRITISH	Avro York ...	4 Merlin	6,400	65,000	10.0	7,800	30	10,000	2,200	210
BRITISH	De Havilland Flamingo ...	2 Perseus	1,780	17,000	9.9	3,240	12	10,000	620	200
BRITISH	De Havilland Albatross ...	4 Gipsy Twelve	2,500	29,500	11.8	5,380	22	11,000	600	210
AMERICAN	Lockheed Lodestar	2 P. & W. S.I.E.3.G.	1,750	17,500	10.0	2,500	10–16	12,000	1,500	190
AMERICAN	Douglas C.47, ... D.C.3 Dakota...	2 P. & W. R-1830	2,400	26,000	10.8	5,000	20	10,000	1,200	170
AMERICAN	Curtiss Commando	2 P. & W. R.2800	4,000	45,000	11.25	8,000	25	50,000	2,500	175
AMERICAN	Consolidated C.87 Liberator Express ...	4 P. & W. R-1830 Turbo	4,800	60,000	12.3	5,900	18	10,000	1,000	200
AMERICAN	Douglas C.54, D.C.4 Skymaster	4 P. & W. R-2000	5,400	62,000	11.3	13,000	26	10,000	2,500	215
AMERICAN	Lockheed C.69 Constellation ...	4 R.3350 Wright Duplex	8,800	90,000	9.3	15,000	35	17,000	2,000	210

THE FIRST 5-YEAR POST-WAR PERIOD: Existing types of British and American aircraft likely to be in operation, with estimated performances.

FUTURE OF CIVIL AVIATION

loading of the tailless will go up to about 50 lb. per sq. ft., whereas for the smaller types to have a thick enough wing to house the necessary equipment and power plant, the wing loading must be of the order of 30 lb. per sq. ft. This brings out the desirability of going as large as possible to gain all the accumulated advantages of the tailless machine. There are experienced engineers who are opposed to attempting a conventional landplane above 250,000 lb., and this is probably a sound view. Should it become desirable, however, to go beyond this, the construction of larger machines might become feasible in ten years' time, using the tailless design with improved materials and constructional technique.

"To attain high speed and long range, machines must go to greater heights taking advantage also of the lower drag characteristics discussed, and we may anticipate seeing, during this third five-year period, the 100-ton machine with a cruising speed of 280 m.p.h. at 30,000ft., using buried power plants."



Layout of 4-engined pusher monoplane with an all up weight of 28,000 lb.

Dealing with the future of the flying-boat, Sir Roy mentioned that it was a subject worthy of a paper on its own. Actually, it would seem that the future of the flying-boat is hanging in the balance, and that, if its design is pursued on existing conventional lines, its future will not be very rosy.

Passenger flying-boats have been one of the outstanding developments of British civil aviation in the past, but due to their employment in what have proved to be a whole number of unsuitable places, and also to lack of sufficient operational experience, come in for unjustified criticism in no small measure.

Some of the outlying air routes of our Commonwealth still have no provision for up-to-date airports. Without proper airfields our long Empire routes will be seriously handicapped, and one cannot visualise airfields of the kind required being built at the smaller bases for many years to come. It would be possible, however, to provide facilities for flying-boats at a cost lower than that of modern concrete runways, and for this reason alone it is felt that there will be a fair demand for moderate-sized flying-boats operating at medium altitudes and with ranges of about 1,000 miles. For large, long-range transatlantic airliners, Sir Roy said he could not believe that there is much to be said for the flying-boat in sizes below 250,000-300,000 lb. However, when we come to aircraft of 300,000-400,000 lb. all up weight, the problems of undercarriages, wheels, brakes and airfields, will obviously become serious, and that, he submitted, is where the large flying-boat will come into its own, providing the necessary initiative and vision is put into the design.

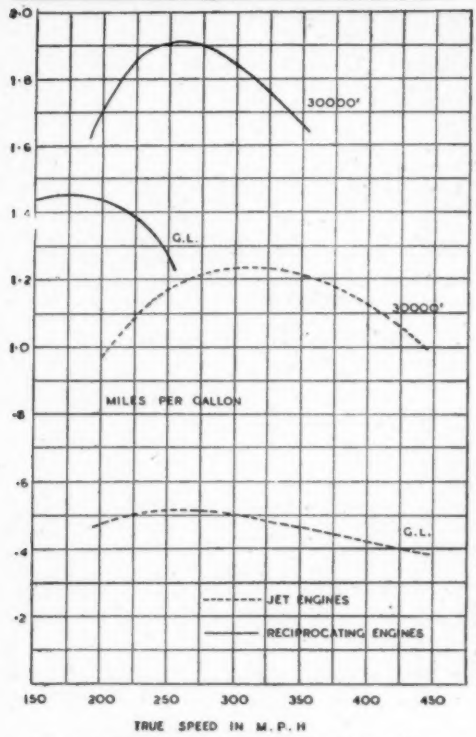
On the subject of fuels and oils for future civil aviation, Sir Roy considered that we shall have to give careful consideration to certain of the low volatility blends generally known as safety fuels, and went on to say that British aero-engine development has, in his submission, suffered a handicap through the practice of conducting development work and all type testing of military machines on oil purchased to a Government specification, viz., D.T.D. 109, which necessitated that the engine should, so to speak, be designed to run on a variable and indifferent quality of oil. Furthermore, since all that was required of the oil supplier was to meet the specification at the lowest possible price, there was little inducement or opportunity for the oil companies to undertake research toward the development of high-performance lubricating oils. This situation is only slightly altered by the modified D.T.D. 472 specification.

	Type	Cooling	Number of Cylinders	Cylinder Layout	Powers		Dry Weight lb.	Specific Weight* lb./h.p.
					Take-off	Economical Cruising		
BRITISH	Rolls-Royce Merlin	Liquid	12	Vee In-Line	1,600	800	1,800	1.12
	Bristol Hercules ...	Air	14	Two-Bank Radial	1,600	800	1,900	1.19
	Rolls-Royce Griffon	Liquid	12	Vee In-Line	1,750	875	1,900	1.09
	Napier Sabre ...	Liquid	24	Horizontal H in Line	2,200	1,100	2,350	1.07
AMERICAN	Allison V-1710 ...	Liquid	12	Vee In-Line	1,200	600	1,350	1.12
	Pratt and Whitney R-1830 ...	Air	14	Two-Bank Radial	1,200	600	1,450	1.20
	Wright R-1820 ...	Air	9	Radial	1,200	600	1,300	1.08
	Wright R-2600 ...	Air	14	Two-Bank Radial	1,700	850	2,000	1.18
	Pratt and Whitney Double Wasp ...	Air	18	Two-Bank Radial	2,000	1,000	2,400	1.20
	Wright R-3350 ...	Air	18	Two-Bank Radial	2,200	1,100	2,600	1.18

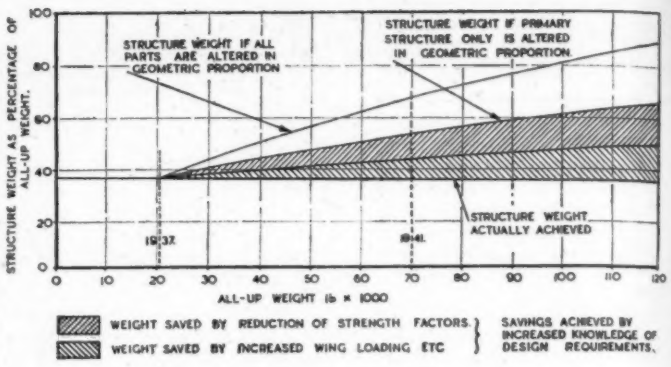
* Approximately 0.4 lb./h.p. should be allowed on liquid cooled engines for the cooling system.

THE FIRST 5-YEAR POST-WAR PERIOD: Representative types of British and American engines likely to be available immediately after the war for civil use, with estimated performances.

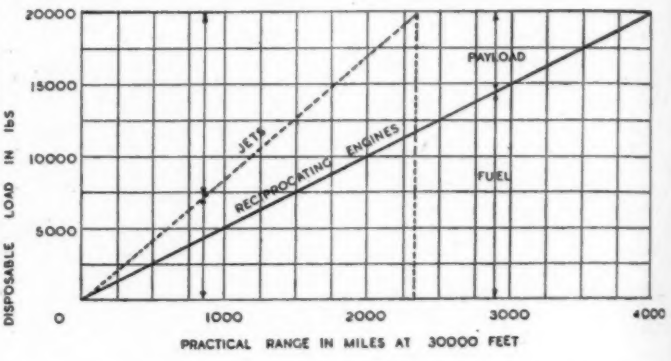
FUTURE OF CIVIL AVIATION



Fuel consumption of aircraft fitted with alternative power units.


STRUCTURE WEIGHT AS PERCENTAGE OF ALL-UP WEIGHT.
100
80
60
40
20
0
STRUCTURE WEIGHT IF ALL PARTS ARE ALTERED IN GEOMETRIC PROPORTION
STRUCTURE WEIGHT IF PRIMARY STRUCTURE ONLY IS ALTERED IN GEOMETRIC PROPORTION
STRUCTURE WEIGHT ACTUALLY ACHIEVED
1937
1941
0 10 20 30 40 50 60 70 80 90 100 110 120
ALL-UP WEIGHT lb × 1000
WEIGHT SAVED BY REDUCTION OF STRENGTH FACTORS
WEIGHT SAVED BY INCREASED WING LOADING ETC
SAVINGS ACHIEVED BY INCREASED KNOWLEDGE OF DESIGN REQUIREMENTS.

Structure weight savings on large aircraft.



Comparison of payload and range of low-drag aircraft fitted with either jets or reciprocating engines.

Sir Roy expressed the view that, relatively speaking, we have less leeway to make up on power plants than on aircraft, but even so there is much to be accomplished, entailing an urgent need for specialised development.

"Obviously," he said, "one turns to the heavy bomber for the necessary background on the most suitable power plants for immediate adaptation to civil use, and the alternative of air cooling or liquid cooling is presented. Prior to this war, the air-cooled engine had gained complete supremacy for civil purposes in all countries, and to such an extent that there are to-day air line operators who say that all civil aircraft engines of the future must be air cooled. This is a state of affairs which has arisen from what might be termed inherited prejudices which we cannot now blindly accept. There may well be a good deal to be said in favour of liquid cooling for future civil aircraft, particularly when we come to buried engines and shaft drives, on the other hand, so long as we retain engines in power plant nacelles on the leading edge of the wing, I am inclined to think that the air-cooled types may have some advantage."

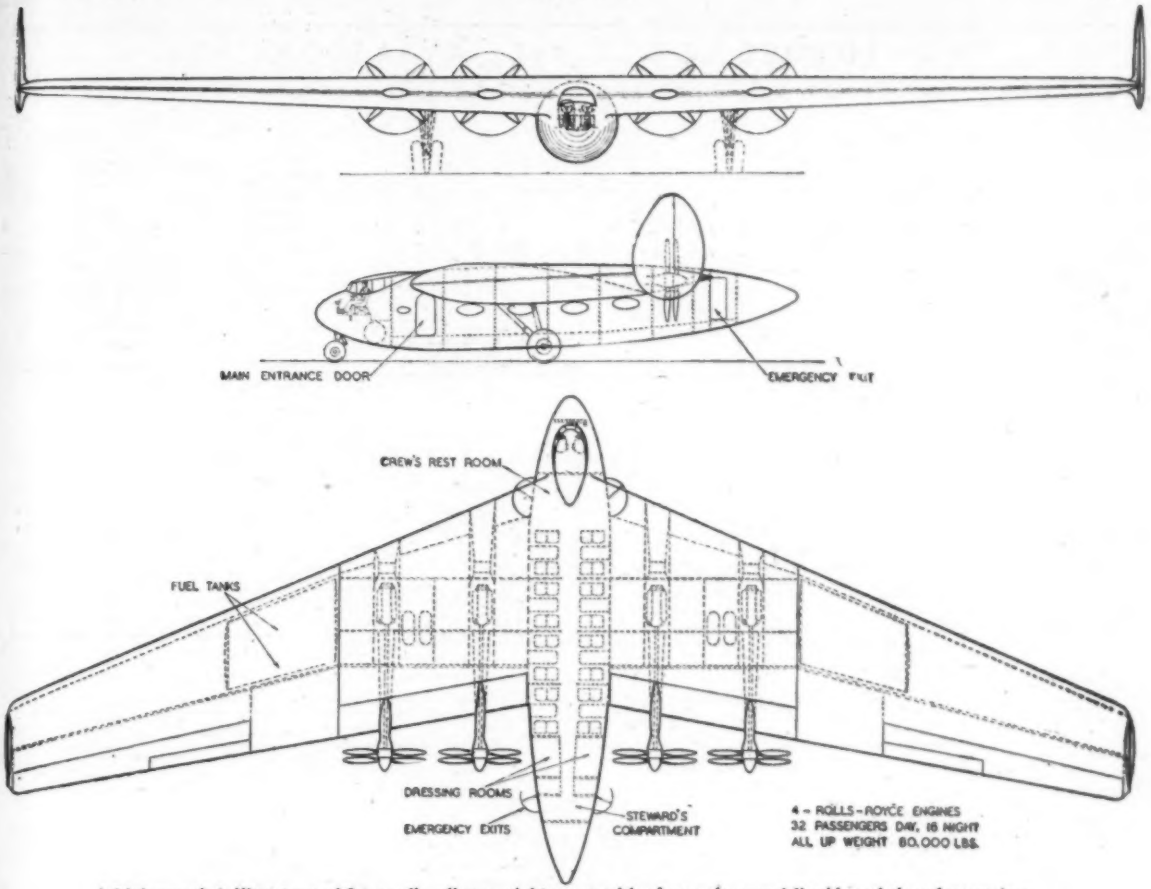
Sir Roy expressed the opinion that assuming the ultimate life of the normal reciprocating engine type

Type	Engines	Total Take-off Power	All up Weight	Power Loading	Nett Payload	Number of Passengers	Normal Operating Height	Normal Range in Still air	Cruising Speed at Normal Operating Height	Purpose
			lb.	lb./h.p.	lb.		feet	miles	m.p.h.	
Landplane	2	700	8,000	11.4	2,000	8	5,000	500	170	Internal Feeder.
Landplane	2	1,700	16,000	9.4	4,000	14	8,000	750	200	Internal Feeder.
Landplane	4	3,200	35,000	10.9	7,000	22	20,000	1,000	220	Dominion and Continental Internal Routes.
Landplane	4	7,200	75,000	10.4	15,000	30	25,000	2,500	235	European, Dominion and Oversea Routes.
Landplane	6	15,000	160,000	10.7	10,000	25	25,000	5,000	250	Long-distance Transoceanic.
Flying Boat	6	18,000	180,000	10.0	10,000	25	25,000	5,000	240	Long-distance Transoceanic.

THE SECOND 5-YEAR POST-WAR PERIOD: Suggested types of British civil aircraft to be designed immediately post-war for operation in this period, with estimated performances.

Type	Engines	Total Take-off Power	All up Weight	Power Loading	Nett Payload	Number of Passengers	Normal Operating Height	Normal Range in Still air	Cruising Speed at Normal Operating Height	Purpose
			lb.	lb./h.p.	lb.		feet	miles	m.p.h.	
Landplane	Turbines with Propellors.	10,000	75,000	7.5	10,000	20	40,000	2,000	400	Continental, Dominion and Oversea Routes.
Landplane	Turbines with Propellors.	20,000	160,000	8.0	20,000	40	30,000	3,000	325	High-speed Transcontinental.
Landplane	Piston type	26,000	250,000	9.6	20,000	40	30,000	5,000	280	Transoceanic.
Flying Boat	Piston type	40,000	400,000	10.0	30,000	60	30,000	5,000	250	Transoceanic.

THE THIRD 5-YEAR POST-WAR PERIOD: Suggested types of British civil aircraft to be designed within the second five-year period for operation in this period, with estimated performances.

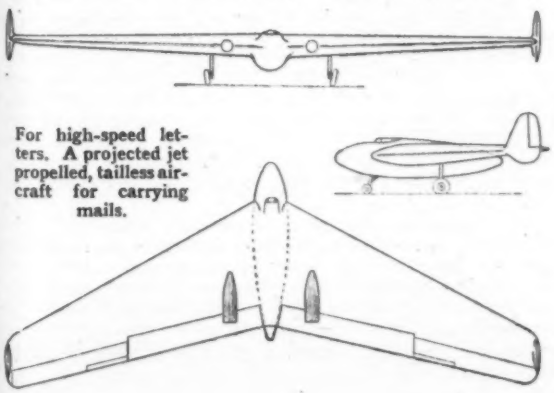


A high-speed, tailless type of 80,000 lb. all up weight powered by four submerged liquid-cooled pusher engines.

may be limited in favour of the gas turbine, we must make hay while the sun shines. We must push on with the design and development of the new, high-power reciprocating engines as a safeguard against any time lags which may occur before the gas turbine power plants enter the realms of practical politics. It requires about three years to develop a redesigned edition of an existing piston engine, but in the case of an entirely new type of modern high-power aero-engine, it takes all of six years, and costs about £2,000,000, and therefore we must not attempt to have too many types. In order to achieve economy in the servicing and maintenance it is desirable to use one type of engine in several types of civil aircraft.

A careful survey of the layout of modern airliners shows the importance of keeping down the number of airscrew centres. "This," said Sir Roy, "should if possible, not exceed four, and whereas it may be necessary in the interregnum period to go to six engines, this being preferable to underpowering a machine or putting in an undeveloped engine, it is essential to endeavour to keep within this limit of four, at any rate for powers up to 25,000 h.p. in machines within the 250,000 lb. range." He felt that we may meet with certain limitations on the size of piston engine which it is practicable to develop, and in the case of one uncoupled unit this will probably be of the order of 5,000 to 6,000 h.p. When we come to larger aircraft therefore, requiring power units of 10,000 to 15,000 h.p., it may well be that the gas turbine will prove to be the most practical solution, and with such a prime mover it might not be so problematic to meet requirements of four airscrew centres.

Sir Roy remarked that British aviation owes a debt of

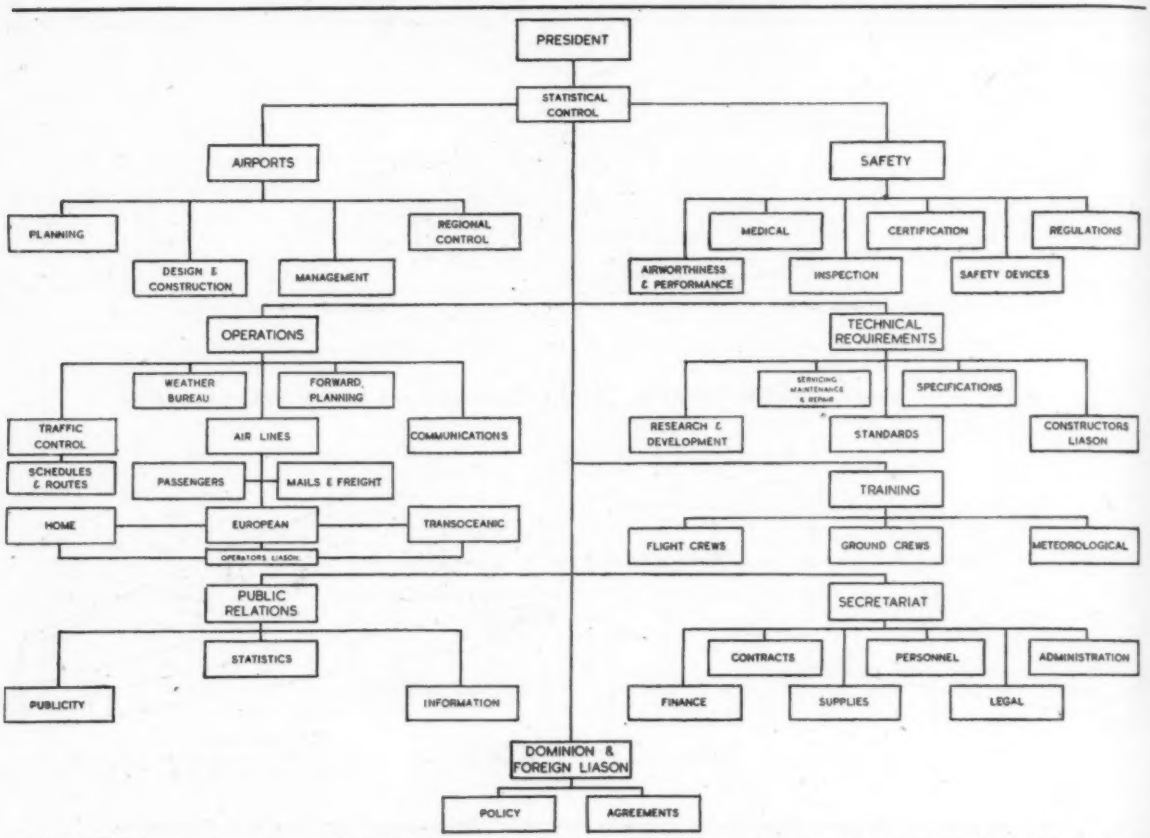


For high-speed letters. A projected jet propelled, tailless aircraft for carrying mails.

Take off Power Required	Economical Cruising Power	Possible Engine Types		Average Dry Weight	Specific Weigh
		Number o Cylinders	Cylinder Layout		
				lb.	lb./H.P.
350	175	6	In-Line	525	1.50
850	425	9	Radial	1,000	1.18
1 300	650	12	Vee In-Line		
		9	Radial	1.450	1.11
		12	Vee In-Line		
		14	2-Bank Radial		
3,000	1,500	18	2-Bank Radial	3,500	1.17
		24	H or X		
		28	4-Bank Radial		
4,000	2,000	24	H or X	4,500	1.12
		28	4-Bank Radial		
		32	H or X		
5,000	2,500	24	H or X	6,000	1.20
		28	4-Bank Radial		
		32	H or X		
		42	6-Bank Radial		

THE POST-WAR PERIOD : Suggested sizes of reciprocating engine for development, with possible characteristics.

FUTURE OF CIVIL AVIATION



Possible broad layout for a separate Civil Air Board. This aspect of post-war civil aviation organisation was dealt with in the initial sections of the lecture.

gratitude to certain members of the Royal Aeronautical Establishment and to Group Capt. Whittle and his colleagues, saying that theirs is a remarkable accomplishment and is only the beginning of what is to come.

He dealt with the two distinct aspects of the employment of the gas turbine; first the use of jet propulsion, and secondly the adoption of the turbine as a prime mover for driving an airscrew. He said it is generally felt that the former will have only a limited application for civil use, as the pure jet-propulsion unit does not compare favourably with conventional power units on an efficiency basis, except at speeds in excess of 450 m.p.h. at altitudes over 30,000ft. He suggested that we should first embark on a high-speed, short-range machine of 30/40,000 lb. weight employing jet-propulsion units, and on this basis it should be possible within three or four years to have a machine with a still air range of 1,000 miles at 30,000ft. and carrying 4,000 lb. useful load, with a cruising speed of 425 m.p.h. Although this might be a special luxury undertaking, it should certainly have a useful application in a restricted class such as express mails, and much kudos and publicity would be gained by the operating company that could first step into this field.

Sir Roy next dealt with landing gear, saying that retractable undercarriages are a truly precision engineering job. They must be kept as light as possible, but of robust construction to take the shock of landing, and the heavy braking and racking loads. The conventional type of undercarriage with its long telescopic strut is not a good engineering structure, as only in one condition has it the freedom of movement which is essential for efficient operation. The cantilever form of construction is, on many new aircraft types in this country, giving way to articulated undercarriage forms in which the shock absorber is pin-pointed.

For long-range aircraft Sir Roy considered that pressure cabins are an essential for the future. The cabins on all future airliners of anything except the smallest feeder-line types should be air-conditioned and pressurised from 8,000ft. upwards.

Sir Roy devoted some time to the use of improved materials in post-war aircraft construction, and said that results of recent investigations suggest that magnesium is worthy of more carefully considered application. On the subject of plastics he said that there is an appreciable field for their application in aircraft, but we are no more likely to see them used for the main structures of passenger airliners in the near future than for complete motor 'bus bodies.

"It is certain," said Sir Roy, "that all civil flying will, after the war, be fully dependent on and controlled by radar and radio services. However good aircraft may be they must depend on radio in the darkness and bad visibility, and instrument flying in conjunction with these services will be the order of the day, making for an unprecedented high level of safety and regularity. It will be necessary to provide public telephone and telegraph facilities for the airborne traveller as for the traveller by sea."

In summing up, Sir Roy considered a major factor in the development of new aircraft designs to be the difficulty and time involved in gathering all the necessary data as to the limiting capabilities, whether in performance, handling or strength. Unless and until the most extensive tests and measurements are made under actual or simulated flying conditions, estimated stresses may err on the side of safety at a cost in weight.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

THE FLYING BOAT

V-bottomed Hulls Automatically Stable

RE the controversy on "amerissage" stability of flying boats please permit me to point out that V-bottomed hulls are automatically stable; i.e., they heel inwards on all turns.

Hence, with really good boats in practically all conditions, with good designs, the wing-tip floats ought only to come seriously into action when moored (*i.e.*, in quiet waters), the hull itself taking care of rough seas and even serious side winds when the craft is properly handled on take-off, etc.

JOHN LAWRENCE, B.Sc.

A.T.C. OFFICERS' DRESS

Inadequacy of the F.S. Cap

IT can hardly be denied that most people look better in a peak cap than in a field service cap, but there are good *physical* reasons for preferring the former.

Except for some Bond Street creations, the F.S. cap is the most inadequate head covering that the wit of man or woman has ever devised. Unlike the Bond Street creation which merely crowns a head of curls, the F.S. cap ineffectively tries to protect the middle-aged bald pate that has basked under an electric lamp all day, and is accustomed by civilian convention to the security of an enveloping felt hat when travelling in the unroofed atmosphere. The average A.T.C. officer is a middle-aged or elderly sedentary worker who is old enough to realise that he cannot do his best if he is constantly laid low through sunstroke or colds through going out with half a hat.

LEONARD TAYLOR,
(Editor, *A.T.C. Gazette*).

THE FAIREY BARRACUDA

An Unfair Comparison

MAY I comment on the first part of B. J. Hurren's article (*Flight*, April 20th) on the Fairey Barracuda?

He claims that these aircraft have done damage comparable to large-scale Fleet actions (c.f. *Scharnhorst*) and prolonged air bombing by land-based bombers (c.f. months of action without *appreciable* result against the *Scharnhorst, Prinz Eugen* and *Gneisenau*).

Now surely he cannot compare the *Tirpitz* action with that of the R.A.F. attacks on the three ships at Brest. For instance, it is a known fact that Brest was the most heavily defended port, or even town, in the world, and the ships also had smoke screens and camouflage nets, whereas in the *Tirpitz* attack the Barracudas had *no* interference from fighters and only moderate A.A. fire, so that they could bomb in comparative safety; also the Fleet Air Arm had the pleasure of taking the Germans by surprise, which never happened and never could happen during the attacks on the ships at Brest.

We all know that the Fleet Air Arm crews made a very gallant raid, but isn't it about time that the critics stopped asking why the R.A.F. failed to sink the *Scharnhorst, Prinz Eugen* and the *Gneisenau?*

S. GLEN.

DRIFT UNDERCARRIAGES

Operated in 60 m.p.h. Cross-wind

YOUR correspondent "Optimist" raises a number of pertinent questions on the advantages to be gained by the use of the drift undercarriage (*Flight*, April 13th).

The point he makes regarding the complications arising from the use of modern "aids to landing" would be well worth developing were it not for the secrecy which surrounds all devices of this nature. It is obvious that the addition of alternative runways must complicate even the simplest devices, thereby not only increasing first cost but also maintenance.

Such aids, however, represent only a small part of the expenditure involved in providing the runways themselves. It is in this connection, therefore, that the case for the single runway is indeed overwhelming.

It should perhaps be made clear that aircraft fitted with drift undercarriages have been flying for several years. They have been operated under the most severe conditions, and have been landed and taken off on occasions at right angles to winds exceeding 60 m.p.h.

It has been found that after very little practice a pilot of average ability is able not only to make landings and take-offs from a single runway in the most adverse conditions likely to be encountered, but also to judge the drift angle required with no other aid than that given by the wind sock. Alternatively, the pilot can, of course, calculate the drift angle in the usual way, or if "blind" landing conditions prevail, be given this information by the ground staff.

Whilst it is true the velocity gradient near the ground varies with the strength of the wind and with local conditions, due allowance for this is always made. The drift angle is not critical, and the speed of the wind at ground level can always be estimated with sufficient accuracy by the pilot.

In the unusual circumstances depicted by your correspondent, *i.e.*, low cloud or fog with strong wind, and without communication with the ground, the brief period during which the ground is visible will be sufficient to enable the pilot to set his wheels to the correct angle; a matter of seconds only. At the worst the pilot can make another run.

Experience shows that the tendency to weathercock is less with the drift undercarriage in a cross-wind than with the conventional type. There is no difficulty, even with light machines, in maintaining a straight course down the runway either before take-off or after landing.

Your correspondent's views on the possibilities of gyro control are interesting, but I should prefer not to comment on these at the moment.

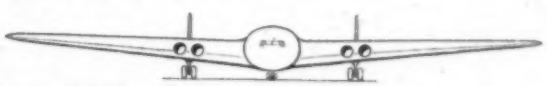
I. J. REES.

JET PROPULSION FOR AIRCRAFT

Flying Wing Design for Transports

ONE of your correspondents has induced me to write a few words on what I think of the development of design. I am without any highly technical knowledge, but this may interest you. *Flight* has always been an upholder of jet propulsion, and I am assuming that this will be the mode of power in the future.

If, however, we try to "fit" jet propulsion to a large aircraft (a freighter), we cannot fit the turbine and large exit tube to the fuselage, as valuable floor space would be taken away. So it seems to me that for large aircraft a "boom" arrangement is desirable, preferably a twin boom. For a large aircraft we would need four J.P. engines, therefore we mount them side by side, and the result is like this:—



But this leads to a very thick wing and thick twin booms. This means that if large freight is to be carried, a large fuselage is necessary. But our fuselage is slung between the booms, and therefore cannot be made longer. Therefore we expand it sideways and allow it to take up the space between the two booms. Now we have virtually arrived at a flying wing. I think that for commercial J.P. aircraft this is the form they will take. There will be no need for a tail unit. Directional stability will be controlled by turned-down wing tips and swept-back wings. To turn the aircraft, all one need do is to accelerate one engine, and the power will turn the aircraft.

R. J. M. BARON.

MANPOWER FOR THE MAMMOTHS

"Handleability" as the Criterion in Aircraft of Any Size

I AM sorry that Capt. Brice, writing in *Flight* of April 13th, has taken my remarks as a criticism of the skill of airline pilots. The point I was trying to make is that the best and most experienced pilot in the world is only human, and that aircraft, even in their present sizes, are very far from perfect.

Relative size, of course, has nothing to do with ease of handling, but there is, as yet, no guarantee that all aircraft will be equally good, and a big aircraft with tricky characteristics is more potentially and expressively dangerous than a small one. A big aircraft, by virtue of its greater complication and weight, is always more of a handful than a small one.

CORRESPONDENCE

and it necessarily follows that, even with the same characteristics, it will be proportionately more dangerous.

As Capt. Brice points out, a Liberator is less tricky than a Hudson. But, for that matter, a Boeing Fortress II is an easier aircraft than either; a Mosquito is less bother, on and near the ground, than a Tomahawk; and a Boston is more straightforward than a Mitchell. The Hudson has done amazingly good work, but I do not think that even the Lockheed people will pretend that this aircraft, or its forerunner, the 14, were "easy" aircraft. Yet, with limited experience as first pilot in each, I would rather bring a Hudson into a strange airfield in bad weather than I would a Liberator.

As for the "airy individuals," I was thinking of the general run of professional pilots between 1930 and 1940; the major airline companies naturally had the pick of available talent. But this talent was still drawn from almost the only available pool—that of ex-Short-Service R.A.F. pilots—and a prospectless Short Service commission did not usually attract the sort of man who might make a sober and careful transport pilot.

Let us hope that after this war flying will be treated by the general public as a sound and worth-while career for all fit, energetic and courageous individuals—and not as a mildly queer occupation for men who, in their late 'teens, were bored misfits in an unexciting world. "INDICATOR."

INFORMATION LEAKAGE

R.O.C. Pledged to Secrecy

I WOULD like to take this opportunity of replying to your correspondent "Ex-A.T.C. and R.A.F.," whose letter appeared in *Flight* of April 20th.

Might I first point out that members of the R.O.C. are required to sign the Official Secrets Act which should thereby prevent them from circulating official information? A.T.C. cadets are not required to sign any such document, and are under no obligation to keep to themselves any information of a secret nature which they may have acquired.

Leakages of information have, for the most part, been of secret aircraft types, and, believe it or not, the R.O.C. has often a more limited access to information of this type than the A.T.C. Indeed, on several occasions the first that a local R.O.C. Post has heard of secret aircraft has been from A.T.C. sources.

Moreover, Air Ministry recognition handbooks are often left at the disposal of cadets to read at their leisure.

G. A. B. SHORT.

Few Young Men in R.O.C.

I WOULD like to be allowed to rebut the allegation made by your correspondent "Ex-A.T.C. and R.A.F." (*Flight*, April 20th) that the Royal Observer Corps is guilty of leakage of information obtained through "having access to unpublished data, probably by reason of the large number of young men in its ranks."

In point of fact the Corps has exceedingly few "young men" in its ranks below the age of 40, and in any case if it is intended to argue that younger men are more likely to commit "security" indiscretions than older men, surely there is another Corps which has many thousands of much younger men who should therefore be held more likely to be blameworthy.

Since the matter has been raised I may say that the R.O.C. has, in fact, no special access to any sources of secret information, and does not even enjoy the privileges accorded to, say, the A.T.C., who are taken on frequent routine visits to R.A.F. stations, being allowed flights in and inspection of operational types of aircraft, with all the attendant opportunities for gathering information helpful to efficiency.

It may surprise your correspondent to know that I, as an average member of the R.O.C. with over 4½ years' service, have only once made a visit to a R.A.F. station, have never had a flight and have never been inside an operational aircraft.

Since the very early days, when the duties of the Corps were merely to report the presence of aircraft and not to know anything of them, right up to the present time, the R.O.C. has been under the disadvantage of not being included in the distribution of "hot" aircraft "gen" supplied to certain other Services as a matter of course. Consequently, it is the case to-day that aircraft are frequently in the air whose data and even names are a mystery to the Corps but which, curiously enough, do not appear similarly wrapped in mystery to many youths and small boys—I wonder why?—"I don't know, mind, but it makes yer think!" OBSERVER.

Hertfordshire.

SORTING OUT THE SNAGS

Theory Without Practice

THE letter in your March 30th issue signed W. D. Blackburn is a perfect example of theoretical knowledge as learnt from a book without any practical experience to back it up. Unfortunately, there are far too many of these theoretical blokes about. The practical ones are so busy sorting out the snags that they rarely have time to rush into print about it.

Theoretically, we all agree, there should be no snags. Aeronautical equipment is tested and proved before it goes into service. But in practice there is hardly an item that does not tend to pack up, sometimes as soon as ever it is fitted to an aircraft. Frequently vibration may be responsible—it is a fact that very few testing rigs include the vibration factor, and in any case it would be practically impossible to reproduce the exact vibration characteristics of the aircraft. That is why the final test is always given to the complete aircraft, and it is surprising how many ground-tested and O.K.'d instruments show up as faulty in the air test.

No, Mr Blackburn, before trying to tell a writer with bags of practical experience, like "Indicator," that he is talking through his hat, you had better acquire at least an equal amount of practical experience yourself.

We have spent the last four years as production test pilots, sorting out snags, and we have often seen "a bunch of experts scratching their heads for hours, etc., etc." The said experts include chief designers, chief engineers and chief A.I.D. inspectors, none of whom could, like Mr. Blackburn, be termed semi-skilled diagnosticians.

TWO PRODUCTION TEST PILOTS.

FLYING FORTRESS (B-17G)

(*Continued from page 477*)

covering being stressed skin and carrying a de-icer strip on the leading edge. The elevators are fabric-covered.

Main planes are of stressed-skin construction with fabric-covered ailerons, only the port aileron carrying a trimming tab and compensating through the balancing cable. Both front and rear spars are of a modified Warren girder construction, the outermost portions of both spars having the bracing struts arranged to form a simple triangulated structure. Ribs are of triangulated form except at fuel-tank locations, where they are of special shape to admit the tanks, of which there are three on each side of the fuselage, as shown in the special drawing. The wing tips are detachable, and a de-icing strip is fitted on the leading edge of each wing and between the engine nacelles.

The nacelles are also of stressed-skin construction and house the oil tanks for each of the 1,000 h.p. nine-cylinder Wright radial engines. The cantilever axle type undercarriage retracts into the inboard nacelles, but the wheels are not fully enclosed. The nacelles also house the turbo-supercharger installation for each of the engines, and an excellent illustration of the layout is shown by the diagrammatic sketch.

Originally the waste gate on each engine installation was individually controlled by the pilot and maintained at a mean position by an hydraulic governor unit. This has now been superseded by an electronic synchronisation system which allows all engine boosts to be controlled, governed and set by a single selector unit in the cockpit. The selector unit has provision for calibrating each engine to compensate for small differences in r.p.m. and boost. A unit known as a "Pressuretrol" registers the carburettor intake pressure, and fluctuations actuate a potentiometer, which, under the "supervision" of a centrifugal governor unit, operates the waste gate motor. Pressuretrols, governors and waste gate motors are mounted in each nacelle, the whole being controlled by the selector unit under the pilot's hand.

This system is certainly an advance in simplifying the pilot's job; he makes his r.p.m. selection with the airscrew pitch controls in the normal way, but the throttles are kept wide open throughout, and the amount of supercharge is selected and governed by the single "tuning" knob. Not only is this done, but the exact degree of boost for each engine is synchronously obtained at the same time.

The Flying Fortress is now, after its nine years of development, a very good military aircraft, well liked by its crews, sturdy of build and eminently capable of both taking and handing out great punishment.

FOR LOW GERMANS: A formation of the new Spitfire XIIs which are specially designed for low and medium altitude fighting.

SERVICE AVIATION

Royal Air Force and Fleet Air Arm News and Announcements

Appointment

Air Vice-Marshal A. F. ROOK, O.B.E., F.R.C.P., M.R.C.S., D.P.H., has been appointed an Hon. Physician to the King in succession to Group Capt. G. S. MARSHALL, O.B.E., M.R.C.S., L.R.C.P., D.P.H., D.T.M. & H., L.D.S., who vacates the appointment on retirement from the Royal Air Force. March 27th, 1944.

Promotion

GENERAL DUTIES BRANCH.

Air Comdre. (temp.) G. H. MILLS, D.F.C., is granted the rank of Group Capt. (war subs.). March 30th, 1944.

Awards

THE KING has been graciously pleased to approve the following awards in recognition of gallantry displayed in flying operations against the enemy:—

Second Bar to Distinguished Service Order

Wing Cdr. G. L. CHESHIRE, D.S.O., D.F.C., R.A.F., No. 617 Sqn.—This officer has commanded the squadron with notable success. Within recent months he has participated in many attacks on targets of vital importance to the enemy, and the successes obtained are an excellent tribute to his outstanding tactical ability, great courage and iron determination. He is a splendid leader, whose personal example and untiring efforts have contributed in a large measure to the high standard of efficiency and fine fighting qualities of the squadron he commands.

Bar to Distinguished Service Order

Act. Group Capt. J. E. FAUQUIER, D.S.O., D.F.C., R.C.A.F., No. 405 (R.C.A.F.) Sqn.—This officer has commanded the squadron with notable success during the past nine months. He has frequently taken part in sorties against distant and well-defended targets, including several attacks on the German capital. He is a forceful and gallant leader, whose outstanding ability and unswerving devotion to duty have been reflected in the fine operational work performed by the whole squadron. Group Capt. Fauquier has set an example of the highest order.

Distinguished Service Order

Sqn. Ldr. B. A. EATON, D.F.C., R.A.A.F., No. 3 (R.A.A.F.) Sqn.—Sqn. Ldr. Eaton has flown on operations in North Africa, Malta, Sicily and Italy. He has led a large number of sorties, during which a medium-sized enemy merchant vessel has been damaged and considerable mechanical transport and one tank destroyed. In air combat this officer has also destroyed two enemy aircraft. On one occasion, when the enemy was pressing our troops hard, he led a fierce attack, compelling the enemy to retreat. An excellent leader and commanding officer, he has never allowed adverse weather or intense anti-aircraft fire to prevent him from locating and destroying his targets.

Flt. Sgt. A. J. W. Heggie, No. 627 Squadron, who has been awarded the D.F.M.

Act. Group Capt. K. J. RAMPLING, D.F.C., R.A.F.—This officer has participated in numerous sorties against well-defended targets. He has invariably displayed great courage and determination in attacking his targets, and his efforts to ensure accuracy have been worthy of the highest praise. He is a magnificent leader, whose personal example has inspired all. On a recent occasion Group Capt. Rampling took part in an attack on Stuttgart. In spite of fierce opposition from the enemy's defences, he executed his attack with his usual determination and accuracy.

Bar to Distinguished Flying Cross

Act. Sqn. Ldr. F. F. COLLOREDO-MANSFELD, D.F.C., R.A.F.V.R., No. 132 Sqn.—This officer has led the squadron on a very large number of sorties over Northern France and the Low Countries and has displayed a high degree of skill and courage. Much of the success of the squadron he commands can be attributed to his inspiring leadership, exceptional ability and zeal. He has destroyed three enemy aircraft.

Act. Sqn. Ldr. K. R. SANDS, D.F.C., R.A.A.F., No. 450 (R.A.A.F.) Sqn.—This officer has participated in many attacks on shipping and had played a prominent part in the successes achieved. In February, 1944, he led the squadron in an attack on a medium sized ship in harbour. The attack was pressed home with great vigour and the vessel was hit from low level. The starboard side of the ship was blown out. Before leaving the area, a target on the island was attacked. A large fire was started, and shortly afterwards a terrific explosion occurred, debris being hurled in all directions over the harbour. By his brilliant leadership, great skill and determination, Sqn. Ldr. Sands contributed in a large measure to the success obtained.

Flt. Lt. C. E. KNOWLES, D.F.C., R.A.F., No. 605 Sqn.—This officer has completed a very large number of sorties, including many successful attacks on airfields, locomotives and barges. In air fighting, Flt. Lt. Knowles has destroyed three

SERVICE AVIATION

enemy aircraft, one of which he shot down after a long pursuit in bad weather. He is a most skilful and determined fighter whose example of devotion to duty has been beyond praise.

Distinguished Flying Cross

Wing Cdr. Lord M. A. DOUGLAS-HAMILTON, O.B.E., R.A.F.V.R., No. 540 Sqn.
Act. Sqn. Ldr. P. W. ARBON, R.A.F.O., No. 29 Sqn.
Act. Sqn. Ldr. V. J. CLARKSON, R.A.F.V.R., No. 502 Sqn.
Act. Sqn. Ldr. J. FINCH, R.A.F.V.R., No. 102 Sqn.
Act. Sqn. Ldr. J. V. HADLAND, R.A.F.V.R., No. 98 Sqn.
Act. Sqn. Ldr. C. A. T. JONES, R.A.F., No. 79 Sqn.
Act. Sqn. Ldr. J. G. KEEP, R.A.F.V.R., No. 181 Sqn.
Act. Sqn. Ldr. P. W. MASON, R.A.F.O., No. 168 Sqn.
Act. Sqn. Ldr. K. C. RITCHIE, R.A.F.O., No. 21 Sqn.
Flt. Lt. H. A GASS, R.A.F.V.R., No. 179 Sqn.
Flt. Lt. F. A. GRANTHAM, R.A.F.V.R., No. 175 Sqn.
Flt. Lt. V. A. HESTER, R.A.F.V.R., No. 613 Sqn.
Flt. Lt. D. D. LIPMAN, R.A.F.V.R., No. 233 Sqn.
Flt. Lt. M. PATERSON, R.A.F.V.R., No. 179 Sqn.
Flt. Lt. A. E. TOMBLIN, R.A.F.V.R., No. 132 Sqn.
Flt. Lt. R. G. WITCOMBE, R.A.F.V.R., No. 280 Sqn.
Flt. Lt. R. R. WRIGHT, R.A.F.V.R., No. 235 Sqn.
Act. Flt. Lt. R. W. LONSDALE, M.M., R.A.F.V.R., No. 88 Sqn.
Act. Flt. Lt. J. G. MEJOR, R.A.F.V.R., No. 112 Sqn.
Act. Flt. Lt. H. E. WALMSLEY, R.A.F.V.R., No. 132 Sqn.
F/O. D. M. ELLIS, R.A.F.V.R., No. 236 Sqn.
F/O. E. PHILLIPPS, R.A.F.V.R., No. 236 Sqn.
F/O. I. H. THOMAS, R.A.F.V.R., No. 157 Sqn.
W/O B. SPENCER, R.A.F.V.R., No. 86 Sqn.
Act. Sqn. Ldr. R. M. CROOKE, R.A.A.F., No. 30 Sqn.
Flt. Lt. S. E. CALDER, R.A.A.F., No. 247 Sqn.
F/O. W. G. LONEY, R.A.A.F., No. 59 Sqn.
Act. Flt. Lt. J. A. H. de le PAULLE, R.C.A.F., No. 422 (R.C.A.F.) Sqn.
Act. Flt. Lt. K. R. LINTON, R.C.A.F., No. 421 (R.C.A.F.) Sqn.
F/O. V. I. GORRILL, R.C.A.F., No. 541 Sqn.
F/O. R. H. WATT, R.C.A.F., No. 415 (R.C.A.F.) Sqn.
F/O. J. E. WILLIAMS, R.C.A.F., No. 215 Sqn.
Wing Cdr. J. R BALMER, O.B.E., R.A.A.F., No. 467 (R.A.A.F.) Sqn.
Act. Wing Cdr. A. W. HEWARD, A.F.C., R.A.F.O., No. 57 Sqn.
Act. Sqn. Ldr. A. MARKLAND, D.F.M., R.A.F.V.R., No. 78 Sqn.
Flt. Lt. A. J. WOODRUFF, R.A.F.V.R., No. 158 Sqn.
Act. Flt. Lt. D. F. CONSTABLE, R.A.A.F., No. 78 Sqn.
Act. Flt. Lt. F. G. LORD, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
F/O. D. C. CAMERON, D.F.M., R.A.F.V.R., No. 158 Sqn.
F/O. R. H. LLOYD, R.A.F.V.R., No. 50 Sqn.
F/O. H. B. MARSHALL, D.F.M., No. 158 Sqn.
P/O. H. E. FINNEY, R.A.F.V.R., No. 158 Sqn.
Flt. Lt. P. MacG WALKER, R.N.Z.A.F., No. 680 Sqn.
Act. Flt. Lt. C. E. J MURPHY, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Act. Flt. Lt. C. J. SPRIGGS, R.A.F.V.R., No. 57 Sqn.
Act. Flt. Lt. W. M. WALTON, R.A.F.V.R., No. 57 Sqn.
F/O. K. H. JONES, R.A.A.F., No. 680 Sqn.
F/O. J. LOWE, R.A.F.V.R., No. 680 Sqn.
F/O. D P WINTER, R.A.A.F., No. 466 (R.A.A.F.) Sqn.
P/O. D. D. GRAHAM, R.C.A.F., No. 466 (R.A.A.F.) Sqn.
Act. Sqn. Ldr. L. A. J. McLEOD, No. 50 Sqn.
Act. Sqn. Ldr. E. H. MOSS, R.A.F.V.R., No. 61 Sqn.
Act. Sqn. Ldr. R. WEBB, R.N.Z.A.F., No. 1435 Sqn.
Act. Flt. Lt. W. D. ERVINE, R.A.F.V.R., No. 9 Sqn.
F/O. K. A. RICHARDS, R.A.A.F., No. 3 Sqn.
P/O. S. C. ATCHESON, R.A.F.V.R., No. 57 Sqn.
P/O. J. M. HYDES, R.A.F.V.R., No. 514 Sqn.
W/O. 1st Class J T. HOUSTON, R.C.A.F., No. 428 (R.C.A.F.) Sqn.
Act. Sqn. Ldr. M. W. DAVY, R.A.F., No. 605 Sqn.
Flt. Lt. D. H. CROUCHEN, R.A.F.V.R., No 62 Sqn.
Flt. Lt. L. J. HARRIES, R.A.F., No. 63 Sqn
Flt. Lt. L. E. SMITH, R.A.F., No. 609 Sqn.
F/O. S. J. P. BLACKWELL, R.A.F.V.R., No. 266 Sqn.
F/O. H. F. COLEBROOK, R.A.F.V.R., No. 29 Sqn.
F/O. R. A. CRONE, R.A.F.V.R., No. 29 Sqn
F/O. W. A. RUSSELL, R.C.A.F., No. 31 Sqn.
F/O A. G. WOODS, R.A.F.V.R., No. 605 Sqn.
Wing Cdr. P. E. MEAGHER, R.A.F., No. 211 Sqn.
Act. Flt. Lt. J. H. DEALL, R.A.F.V.R., No. 266 Sqn.
F/O. N. J. LUCAS, R.A.F.V.R., No. 266 Sqn.
F/O D. F. RUCHWALDY, D.F.M., R.A.F.V.R., No. 129 Sqn.
F/O. J. N. YATES, R.A.F.V.R., No. 607 Sqn.
Act. Maj. C. CORMACK, S.A.A.F., No. 15 (S.A.A.F.) Sqn.
Act. Flt. Lt. J. C. DOYLE, R.A.A.F., No. 3 Sqn.
Act. Flt. Lt. H. E. T. TRIPLOW, R.A.A.F, No. 149 Sqn.

Conspicuous Gallantry Medal (Flying)

Act. W/O. G. W BROOK, R.A.F.V.R., No. 550 Sqn.—This officer has completed a successful tour of operations, during which he has attacked Berlin on ten occasions. He has at all times displayed praiseworthy determination in the execution of his tasks, many of which were undertaken in adverse weather. He is a most efficient captain, whose example of courage and devotion to duty has proved inspiring.

Distinguished Flying Medal

Flt. Sgt. C. J. GRAY, R.A.F.V.R., No. 61 Sqn.
Sgt. S. BRADFORD, R.A.F.V.R., No. 57 Sqn.
Sgt. W. CRAIG, R.A.F.V.R., No. 61 Sqn.
Flt. Sgt. (now W/O.) D. G. LIGHTFOOT, R.C.A.F., No. 57 Sqn.
Sgt. R. DIXON, R.A.F.V.R., No. 101 Sqn.
Sgt. W. J. WALTON, R.C.A.F., No. 431 (R.C.A.F.) Sqn.
Flt. Sgt. W. H. JOHNSON, R.A.F.V.R., No. 605 Sqn.
Flt. Sgt. W H. PERRY, R.A.F.V.R., No. 31 Sqn.

THE KING has been graciously pleased to approve the following awards in recognition of distinguished service with the Royal Air Force:

Air Force Cross

Act. Sqn. Ldr. H. L. DERWENT, R.A.F.V.R.
Sqn. Ldr. A. C. SMITH, R.A.F.V.R.
Act. Sqn. Ldr. A. E. BALLAM, A.F.M., R.A.F.
Act. Sqn. Ldr. H. F. BUCKNELL, R.A.F.
Act. Sqn. Ldr. A. W. FARRELL, R.A.F.V.R.
Act. Sqn. Ldr. T. C. PICK, R.A.F.V.R.
Flt. Lt. E. V. ASPLIN, R.A.F.
Ft. Lt. B. C. BENNETT, R.A.F.O.
Flt. Lt. A. A. BETTS, R.A.F.V.R.
Sqn. Ldr. C. C. J. BARRITT, R.A.F.V.R
Flt. Lt. R. M. BRYDEN, R.A.F.V.R.
Flt. Lt. E. R. DUTT, R.A.F.V.R.
Flt. Lt. G. B. ECCLES, R.A.F.V.R.
Flt. Lt. T. H. HAYTER, R.A.F.
Flt. Lt. H. W. HORSLEY, R.A.F.V.R.
Flt. Lt. E. D. JACK, R.A.F.V.R.
Flt. Lt. V. H. KING, R.A.F.
Flt. Lt. H. P. LAVENDER, R.A.F.V.R.
Flt. Lt. A. R. MAYELL, R.A.F.
Flt. Lt. L. R. J. OVENDEN, R.A.F.
Flt. Lt. N. B. RUTHERFORD, R.A.F.V.R.
Flt. Lt. R. B. STEVENSON, R.A.F.V.R.
Flt. Lt. J. K. WILSON, R.A.F.V.R.
F/O. G. E. ADDY, R.A.F.V.R.
F/O. W. R. G. EXELL, R.A.F.V.R.
F/O. H. E. HERITAGE, R.A.F.V.R.
F/O. J. N. SOMERS, R.A.F.V.R.
F/O. C. F. J. WATTS, R.A.F.
P/O. F. M. JONES, R.A.F.V.R.
W/O. N. STRATTON, R.A.F.V.R.
Sqn. Ldr. M. DE PRETT-ROOSE, R.C.A.F.
Flt. Lt. B. K. BRODSKY, R.C.A.F.
Sqn. Ldr. N. S. PARRY, R.A.A.F.

Air Force Medal

Flt. Sgt. W. SWANN, R.A.F.V.R.

Roll of Honour

Casualty Communiqué No. 378.

THE Air Ministry regrets to announce the following casualties on various dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list, 144 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. R. E. Appleton; P/O. H. J. Benson; Flt. Sgt. A. C. Fance; Sgt. W. Iddon.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. W. E. Bailey; Sgt. W. H. Buffery; Sgt. A. J. Cossins; P/O. W. Green; Sgt. C. Lafford; Sgt. A. C. Marsh; Act. Flt. Lt. J. Reid; Sgt. J. A. Walls; Sgt. N. Wilbraham; P/O. F. Worsnop.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. E. J. T. Altham; Sgt. F. Ball; P/O. N. L. Ballamy; F/O. D. M. A. Banton; Sgt. J. E. Beedles; Sgt. J. R. Bell; Sgt. H. J. T. Bennett; Sgt. E. C. Bishop; Sgt. E. B. Bottomley; F/O. W. H. Boundy; Sgt. E. A. Bowman; Sgt. A. Boydell; Sgt. B. S. Bridge; Sgt. G. W Brown; Sgt. W. G. Brown; Sgt. T. M. A. Burgess; Sgt. R. H. Burn; Sgt. D. J. Carrington; Flt. Lt. F. G. H. Chalk, D.F.C.; F/O. J. Cheney; Sgt. G. J. Church; Sgt. E. E. Coker; Sgt. P. J. Court; F/O. E. F. Davey; Sgt. C. T. O. Dudley; Sgt. W. Dunn; Sgt. G. A. P. Edwards; Sgt. A. M. Fox; Sgt. G. R. Hale; Flt. Sgt. J. W. Harbidge; Sgt J. McG. Hargreaves; Sgt. G. R. Hazell; P/O. J. Henderson; P/O. T. A. Holman; Flt. Sgt. J. Howes; P/O. E. C. Hughes; Sgt. R. Jackson; Sgt. G. R. Jacques; Sgt. R. O. Jasper; Sgt. B. A. W. Jennings; Sgt R. L. Johnson; F/O. L. G. Kennett; Sgt. A Kenyon; Sgt. C. P King; Sgt. P. Koek-Koek; Act. Flt. Lt. B. MacM. Laing; F/O. J. Ledgard; Sgt. E. M. Lee; Act. Flt. Lt. L. B. Lee; Sgt. W. C. Lewis; Sgt. J. Lindley; Flt. Lt. J. C. Lowe; Sgt. P. D. McArdle; Sgt. W. J. McKay; Sgt. K. A. Maddock; F/O. E. W. Marsden; Sgt. G. A. Mason; Sgt. W. Mitchell; Sgt. J. K. Morgan; Sgt. S. H. Mortimer; P/O. K. G. Mott; Sqn. Ldr. W. E. Mulford; Sgt. H. C. W. Nash; Sgt. T. Nicholson; Flt. Sgt. V. J. Norman; Sgt. D. G. M. Ofield; Sgt. D. O'Sullivan; Sgt. J. A. Ottey; Sgt. H. S. Pagett; Sqn. Ldr. E. H. Parrott; Flt. Sgt. F. C. Payne; Sgt. E. L. Pugh; F/O. W. Randolph; Sgt. L. J. Ray; Sgt. K. W. Read; Sgt. S. Redpath; Sgt. J. Reid; Flt. Sgt. J. D. Reynolds; Sgt. G. W. Rockwood; Sgt. W. C. Rowlands; F/O. G. R. Royde, D.F.C.; Sgt. D. Rudge; F/O. J. H. Sams; Sgt. F. W. Sanderson; F/O. D. C. Sawyer; Sgt. A. Selves; Sgt. A. Shacklady; Flt. Sgt. W. Slater; Sgt. A. A. Smith; Sgt. A. F. R. Stanton; F/O. G. R. Sugar; Sgt. J. Sutcliffe; Sgt. R. E. Thompson; Sgt. P. W. Thornycroft; Sgt. E Towe; Sgt. S. E. Tuck; Sgt. H. F. Upperton; F/O. H. L. Walmsley; Sgt. J. Watson; Sgt. F. J. Willett; Sgt. S. E. Williams; F/O. J. E Wilson; Sgt. A. A. T. Woodard; F/O. J. E. Wootton; Sgt. J. O. Young.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. A. Beaumont; W/O. G. H Stevens.

WOUNDED OR INJURED IN ACTION.—Sgt. A. C. Clark; Flt. Lt. B. D. Hanafin; Sgt. R. J. Smith; Sgt. J. R. Steele.

DIED OF WOUNDS OR INJURIES RECEIVED IN ACTION.—Sgt. P. Clarke.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Lt. C. E. Brayshaw; Sgt. D. J. Brewer; F/O. S. H. Cheeseman, Flt. Sgt. A. A. Pardoe; Flt. Sgt. K Sims; F/O. H. Wallis.

MISSING.—Sgt. R. N. Aitken; Sgt. A. R. Albone; Act. Flt. Lt. C. H. Armour; Sgt. E. Auty; Sgt R. F. Banks; Act. Flt Lt. R. L. Barnes; P/O R. C. Bett; Flt. Sgt. F. G. D. Bloom; Sgt W. F. D Bolt; Flt. Lt. J. A. Broadley, D.S.O. D.F.C., D.F.M.; Sgt G. E. Brown; Flt. Sgt. H S Brown; Flt. Sgt. L. Burton; Sgt. J. A. Byars. Flt. Sgt. E. Campbell; Sgt. F. Clarkson; Sgt W. S. Crockford; F/O. J. S Cross; Sgt E. W

DEGREASED LIGHTNING: Steam cleaning the packing grease from a P.38 on arrival at an air base in Britain.

Curzon; Sgt. J. R. Dalziel; Sgt. J. A. Davies; Sgt. T. J. G. Davies; P/O. E. J. Edwards; Sgt. R. Giles; Sgt. R. W. Gray; Sgt. G. H. Griffiths; Sgt. W. R. Hales; Sgt. E. Harper; Sgt. A. Hartley; Flt. Sgt. W. U. Humphreys; F/O. R. C. Hunter; Sgt. F. R. Jeffcoate; Sgt. G. A. Jonas; Sgt. W. A. G. Kibble; F/O. H. Kidd; F/O. P. Kinsella; P/O. V. A. R. Langford; P/O. J. Laurens; Flt. Sgt. W. D. L. Lloyd; P/O. J. T. D. McLachlan; Flt. Sgt. E. Marshall; P/O. J. L. Miller; Sgt. E. C. Nott; F/O. R. P. D. Perkins; Act. Group Capt. P. C. Pickard, D.S.O., D.F.C.; Flt. Lt. R. C. Pickering; Sgt. D. M. Pottinger; Sgt. A. E. Reeve; Sgt. D. Robinson; F/O. A. J. Sharpe; Flt. Sgt. G. M. Storey; Flt. Sgt. J. S. Sutherland; Sgt. F. C. Thomas; W/O. J. Thomson; F/O. W. G. Tibbits; P/O. C. H. Waight; Sgt. F. R. Webster; Sgt. T. K. M. Williams; Sgt. C. C. Wood; Sgt. L. A. Young.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE.—Cpl. L. V. Madley.

KILLED ON ACTIVE SERVICE.—Sgt. H. C. Blackett; F/O. E. C. Braun; Sgt. J. T. Brockbank; F/O. J. L. Clifton; Flt. Sgt. T. Evans; P/O. C. H. M. Folkard; Sgt. G. C. Hawkins; Sgt. E. B. Hayball; Sgt. W. Hicklin; P/O. D. Hudson; F/O. E. McNulty; Sgt. C. E. Raikes; Flt. Sgt. M. O. Samuels; Sgt. H. Sherwood; Sgt. R. W. Surman; W/O. H. Taylor; P/O. L. H. Teer; F/O. C. J. Thorpe; Flt. Sgt. J. R. Upperton; F/O. S. C. Urquhart; Sgt. S. K. Yates.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. S. Borrill; L.A/C. N. Edwards; F/O. V. B. Field; Flt. Sgt. E. Hallas; Flt. Lt. J. M. Inglis; Flt. Sgt. E. Mallon; Flt. Sgt. D. W. O'Leary; Sgt. J. M. Snowden; Wing Cdr. G. E. Wallace.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—L.A/C. S. Newman.

Lt. Cdr. G. K. Quill, O.B.E., A.F.C. while serving on the escort carrier H.M.S. *Ravager*. As one of the Supermarine company's test pilots he carried out most of the early work on the prototype Spitfires. He was the first pilot to take a Spitfire up at night.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Flt. Lt. A. J. Baker; A/C.2 G. H. Costigan; F/O. G. H. Scobie.

DIED ON ACTIVE SERVICE.—L.A/C. W. L. Brookes; L.A/C. C. C. Coles; Cpl. G. H. Dalton; A/C.2 S. B. Fitzjohn; L.A/C. H. J. Giles; L.A/C. A. R. Hookway; L.A/C. I. John; L.A/C. W. Keyworth; F/O. C. Lloyd; L.A/C. R. A. P. Pott; A/C.2 D. Price; Cpl. B. H. Roberts; A/C.1 D. L. Savill; A/C.1 N. C. Snowden; Cpl. E. A. C. Stammers; L.A/C. T. Vizard.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. J. A. Dobson; Flt. Sgt. W. A. Eacott; Sgt. A. L. Jacques; F/O. D. C. Knight; P/O. W. B. P. Pritchard; F/O. G. J. Sleeman; Sgt. F. H. Smooker.

Royal Australian Air Force

KILLED IN ACTION.—Flt. Lt. R. C. Hay, D.F.C.; Flt. Sgt. S. W. B. Martin; F/O. A. W. Walker.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. K. Fairlie; F/O. L. E. Harrison; F/O. R. J. Hefferman; Flt. Sgt. J. W. Lawson; Flt. Sgt. B. J. Lockrey.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. A. W. Downing; W/O. A. R. Stratton.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. S. S. Wills.

MISSING, BELIEVED KILLED IN ACTION.—P/O. E. Bremner.

NOT TO BE LOOKED DOWN UPON: Gen. Eisenhower, Gen. Brereton (top left), Air Marshal Sir A. Coningham (top right), Group Capt. C. R. Dunlap (centre left), and Air Chief Marshal Sir Trafford Leigh-Mallory (bottom right), during a visit by the Supreme Allied Commander to an R.A.F. medium bomber wing.

MISSING.—Flt. Sgt. J. R. Everett; Flt. Sgt. L. A. Laver; W/O. A. McPhee; W/O. J. F. Moran; F/O. M. G. Pepper; Flt. Sgt. W. R. Sutton; F/O. R. B. Tuff; Flt. Sgt. R. E. Wilson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. C. Toft.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. D. J. Ashby-Peckham; Act. Flt. Lt. F. Hilton, D.F.C.; Flt. Sgt. K. W. Morrison.

MISSING.—F/O. G. H. Fowler; Act. Flt. Lt. R. N. Johnstone; Act. Flt. Lt. F. C. Jones, D.F.C.; Flt. Sgt. V. G. Tunnicliffe.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. T. M. Clothier.

South African Air Force

DIED ON ACTIVE SERVICE.—Flt. Sgt. Burnett.

Casualty Communiqué No. 379

Of the names in this list, 151 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—P/O. N. Caffery; Sgt. A. F. Fitton; Sgt. G. F. Gillings; Sgt. F. A. C. Harris; P/O. P. M. Jennings; Sgt. G. H. Jones; Flt. Sgt. H. E. Jones; Sgt. E. J. Rowe; P/O. C. J. Seymour.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. A. G. Bristow; Sgt. W. Worthington.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—W/O. J. Allen; Sgt. W. Anderson; Sgt. T. H. Bell; Flt. Sgt. D. W. Bellamy; Sgt. R. W. Bennett; Act. Wing Cdr. W. O. V. Bennett, D.F.C., A.F.C.; Flt. Sgt. E. N. Bird; P/O. B. H. Church; F/O. J. S. Clements; Sgt. A. A. Crank; Flt. Sgt. P. Crawforth; F/O. M. G. Curtis; Sgt. L. L. Davis; Sgt. W. T. Davis; Sgt. C. W. Dixon; Flt. Sgt. G. B. Fielder; Sgt. L. E. Fuller; Sgt. J. C. Gardner; Sgt. S. J. Greer; Sgt. M. F. Haley; Sgt. W. H. Hodges; P/O. A. E. Humphreys; Sgt. C. P. Johns; Sgt. L. D. Lingwood; Sqn. Ldr. J. R. Manahan, D.F.C.; Sgt. C. A. Margerum; P/O. R. B. Miller; Sgt. F. Mills; Sgt. W. R. Newton; Sgt. W. N. Nisbet; Sgt. H. Owen; Sgt. R. M. W. Selby-Lowndes; Sgt. H. F. Sheppard; Flt. Sgt. J. M. Steel; Sgt. W. A. Taylor; Sgt. H. Taylorson; F/O. J. F. Tritton; Sgt. E. D. Tuddenham; Sgt. J. Tweedie; Sqn. Ldr. A. de Q. Walker, D.F.C.; Flt. Lt. K. Webster; P/O. D. M. Weddell; Sgt. C. E. Wiggett.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. M. F. Godfrey; Flt. Sgt. R. P. Hayles; Sgt. E. R. Hughes; F/O. J. K. Morrison; Flt. Sgt. G. Slater; Sgt. A. E. J. Sleven.

MISSING.—Sgt. T. C. Akeroyd; Sgt. G. H. Bodycot; Sgt. C. Bolder; Sgt. R. Booth; Sgt. W. L. Bradley; Flt. Sgt. J. Briggs; Act. Flt. Lt. J. L. Brown; P/O. I. G. Bunn; F/O. J. S. Cant; Flt. Sgt. G. Carrell; F/O. F. Chambers; Sgt. R. J. Chaplin; Sgt. H. Cook; Sgt. D. Copley; F/O. W. P. Cragg; Sgt. F. W. Daplyn; Sgt. J. P. Downs; Sgt. H. Dunn; Sgt. H. Eaton; F/O. A. H. Ellis; Sgt. G. H. Foreman; P/O. R. Halperin; Sgt. E. W. Hamilton; Flt. Sgt. T. A. Hamilton; Sgt. H. Hemmings; Flt. Sgt. T. D. Henderson; Sgt. C. A. Hilton; Sgt. S. Hopkinson; Sgt. C. McK. Hossack; Sgt. W. H. Johnson; Flt. Sgt. T. F. Johnston; Act. Flt. Lt. R. V. Jones; F/O. L. T. Lambourn; Sgt. M. Latham; P/O. W. H. Liddiard; Sgt. P. B. McLaughlin; Sgt. T. McCall; Sgt. A. J. McCord; Sgt. C. H. Marsh; Sgt. I. D. J. May; Flt. Sgt. B. B. Millen; Sgt. A. W. Mitton; F/O. J. Moffatt; Sgt. C. Morrice; Sgt. F. H. Morton; Act. Sqn. Ldr. A. Muir, D.F.C.; Sgt. J. J. Murphy; P/O. S. W. G. Neighbour; Sgt. P. Newberry; Sgt. H. K. Ormrod; Sgt. F. G. F. Osborne; Flt. Lt. B. O. Petrides; Flt. Sgt. L. C. Pillinger; Sgt. T. J. Pullman; Sgt. J. C. L. Reed; Flt. Sgt. B. S. Reynolds; Sgt. G. P. Roche; Sgt. G. W. Rugg; P/O. T. H. Smith; F/O. A. Stevens; Sgt. B. C. Stewart; Sgt. F. J. Taylor; Sgt. V. L. Twydell; Act. Flt. Lt. J. W. Warren, D.F.C.; F/O. W. R. Waugh; Sgt. W. J. Webb; Sgt. A. C. Wilby; Flt. Sgt. R. E. Whitebeard; Act. Flt. Lt. J. I. Wiseman; Flt. Sgt. J. A. Yeomans.

KILLED ON ACTIVE SERVICE.—Sgt. C. Bewick; Sgt. J. T. Brownhill; Sgt. B. H. Burson; P/O. N. F. Cherry; Flt. Sgt. E. A. Creber; Sgt. H. Little; Wing Cdr. V. E. Maxwell; Flt. Sgt. W. E. Preston.

WOUNDED OR INJURED ON ACTIVE SERVICE.—W/O. H. Knape; A/C.2 E. Rose; L.A/C. J. Rothwell.

DIED ON ACTIVE SERVICE.—A/C.2 C. J. Foster; L.A/C. P. J. Pritchard.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Lt. C. A. F. Curwen; F/O. F. C. Gale; Sgt. W. V. Garfield; W/O. A. J. Guy; Act. Sqn. Ldr. M. J. Harris; F/O. W. C. H. Johnson; Act. Sqn. Ldr. D. J. Kilgallin; F/O. D. McMillan; F/O. T. Mitchell; F/O. N. G. Price; F/O. J. C. Pyne; Act. Flt. Lt. J. E. Walton; F/O. H. Wardle; F/O. N. A. Wright.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. J. H. Davie; Flt. Sgt. J. T. Winterbon.

WOUNDED OR INJURED IN ACTION.—Flt. Sgt. G. C. C. Smith.

MISSING, BELIEVED KILLED IN ACTION.—P/O. H. C. L. MacKintosh; Flt. Sgt. O. P. Smith.

MISSING.—Flt. Sgt. G. C. Brasington; P/O. K. J. Godwin; Flt. Sgt. F. A. Hennessey; P/O. L. E. Jackson; F/O. J. N. Morris; Act. Flt. Lt. R. J. Mortimer; F/O. W. H. Murray; W/O. J. H. Smith; P/O. I. C. Young.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Flt. Lt. E. R. B. Roberts.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. G. R. Fitzsimmons; F/O. W. M. Hegy; F/O. R. K. Laut; Flt. Sgt. R. W. Moody; P/O. W. A. Reason.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. R. H. Dengo; W/O. C. P. Fitzpatrick; F/O. E. McL. Johnston; Flt. Sgt. D. T. Shaw; P/O. C. W. Webb.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. J. R. Archambault; Flt. Sgt. A. Arlen; P/O. G. W. Armstrong; P/O. G. E. Bisheff; P/O. R. Bradley; L.A/C. T. R. Brookes; P/O. W. C. Campbell; F/O. E. N. Cinderay; Flt. Sgt. W. L. Cogger; F/O. J. E. B. Craigie; Flt. Sgt. J. J. B. S. P. H. David; Flt. Sgt. A. Davidson; Flt. Sgt. C. L. Dyson; P/O. K. Earnshaw; Sgt. M. G. K. East; Act. Flt. Lt. H. F. Ewer; Act. Flt. Lt. G. W. N. Fanson; F/O. A. R. A. Farquhar; P/O. E. Q. Findlay; F/O. G. W. Fitzgerald; Sgt. J. L. Fletcher; P/O. R. G. Fowlie; Flt. Sgt. W. W. Freeland; P/O. H. G. Froude; P/O. B. S. Fudge; Flt. Sgt. K. M. Gillies; Flt. Sgt. A. E. Hagan; F/O. R. B. Harris; F/O. S. M. Heard; Flt. Sgt. F. J. Higgins, D.F.M.; P/O. R. S. Hollowell; Sgt. J. A. C. Holmes; P/O. D. C. Horner; F/O. G. H. Hubbell; P/O. L. T. Jackson, D.F.C.; Flt.

SERVICE AVIATION

Sgt. W. Kashmar; P/O. W. R. King; Flt. Sgt. H. O. Lee; Flt. Sgt. J. A. Leighton; Flt. Sgt. N. T. MacAulay; F/O. G. F. McCleary; Sgt. I. MacDonald; Flt. Sgt. J. C. MacDonald; F/O. A. K. MacDougall; Flt. Sgt. J. W. McKendry; Cpl. J. F. MacKenzie; Sgt. G. M. McLean; Flt. Sgt. V. D. McMurachy; F/O. J. E. McNamara; P/O. D. J. McNeill; Flt. Sgt. D. S. McRae; F/O. G. T. Matynia; Sgt. O. Minor; Flt. Sgt. R. D. W. Moulton; Sgt. C F. Orlinski; F/O. P. J. Pascoe; P/O. C. C. Reichert; F/O. B. B. Reid; Flt. Sgt. J. H. Renaud; Act. Flt. Lt. M. Samuels; Sgt. C. L. Sebelius; Sgt. R. A. Shaw; Act. W/O. J. Slugoski; Flt. Sgt. E. A. Sproule; Flt. Lt. J. R. Sterne, D.F.C.; Flt. Sgt. R. Stewart; Sgt. R. R. Stickney; Act. Sqn. Ldr. J. G. Stronach; P/O. L. L. V. Toupin; W/O. W. A. Trask; Flt. Sgt. W. D. Walsh; Sgt. W. W. Wilson; Flt. Sgt. A. K. Young.

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. W. Forrest; Flt. Sgt. B. D. Howard; Flt. Lt. J. V. Russell, C.G.M.; Flt. Sgt. S. Tatai; Flt. Sgt. T. O. Wilson.

MISSING.—F/O A. S. Barclay; W/O. J. E. Davidson; F/O. G. P. Davies; Sgt. J. F. G. R. Dehoux; Sgt. J. B. Fraser; Sgt. J. Hein; P/O. O. F. Hyndman; Flt. Sgt. J. Luck; Flt. Lt. D. K. MacKay, D.F.C.; Flt. Sgt. R. J. McKay; Flt Sgt. A. McG. Matheson; Flt. Sgt. J. Oliver; P/O. D. Riach; F/O. H. P. Theriault.

KILLED ON ACTIVE SERVICE.—W/O. T. Barlow; F/O. E. L. Dixon; P/O. W. S. Heal; F/O. V. J. Hillman; F/O. D. J. Hope; P. O. J. A. Menzies; Flt. Sgt. R. M. Sinclair.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. P. B. Code.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Sgt. W. C. Anderson; W/O. J. G. Damboise; W/O. A. S. Davidson; W/O. W. J. Mullaney.

AFTER THE RAID: The Station commander of a Bomber Command station watches the return of his aircraft from Germany. The ambulance and crash tender stand by in case of need.

Royal New Zealand Air Force

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. A. T. Little.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Lt. A. W. Doel; F/O. O. K. Jones; Flt. Sgt. L. G. Porritt; Flt. Sgt. O. K. Whyman.

MISSING.—Flt. Sgt. A. C. Hamilton.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. R. Broun.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Flt. Sgt. J. S. J. McPhail.

Casualty Communiqué No. 380

Of the names in this list 155 are second entries giving later information of casualties published in earlier lists.

Royal Air Force

KILLED IN ACTION.—Sgt. D. G. Davies; F/O. B. Denness; P/O. E. H. Edwards; Cpl. H. E. Hedges; F/O. J. A. Irwin; Flt. Sgt. P. H. Kilaby; Sgt. E. Vamplough; Cpl. J. L. Walker.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—P/O. V. Baker; Sgt. J. Billington; Sgt. D. R. Browne; Sgt. A. Bryan; F/O. D. J. Carpenter; F/O. G. Cockayne; F/O. H. M. Etherington; Sgt. J. Fiddler; Act. Flt. Sgt. R. Hamblin; P/O. P. Hobbs; Sgt. E. Y. Howes; Flt. Sgt. W. G. Jackett; Sgt. H. McQuade; Sgt. E. H. Pegg; F/O. A. J. Perkins; Sgt. R. Rushton; Sgt. W. J. Vaughan; Sgt. C. H. A. Warner; P/O. J. F. Waterman; Sgt. W. Webster; Flt. Sgt. D. S Wood.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. R. G. Akers; Sgt. W. Anderson; Sgt. A. Armstrong; Sgt. T. M. Atkinson; Sgt. E G. Baker; Sgt. H. F Barham; Sgt. A. T. Barlow; Sgt. F. V. Barnard; F/O. A. S. Barrie; Sgt. T. Bennett; F/O. R. C. Bishop; Sgt. E. R. Black; Sgt. W. Blackie; Sgt. J. R. Boxall; Sgt. W. S. Brooks; Flt. Lt. A. McK. Brown; Sgt. R. L. Cant; F/O. M. A. Chapman; Sgt. L. Clifton; Sgt. J. Condron; Sgt. G. H. Cox; Sgt. J. D. Cresswell; Sgt. R. J. Dash; Flt. Sgt. H. E. Davies; F/O. T. Davies; Sgt. W. E. Delaney; Sgt. M. Edwards; Sgt. R. H. Elliott. Sgt. N. N. England; Sgt. C. R. Fenwick; Sgt. D. W. Firth; Sgt. H. E. Fisher; Sgt. J. Fitzsimmons; Sgt. R. Forster; Sgt. J. B. Foskett; P/O. W. R. Gardiner; Sgt. N. R. Gauntlett; Sgt. K. Gore; Sgt. F. H. Gould; Sgt. N. Graham; Sgt. E. Grainger; P/O. W. L. Gray; Sgt. G. C. Green; Sgt. L. A. Harrison; Sgt. J. Hetherington; Sgt. G. A. Hill; Sgt. A. L. T. Hosking; Sgt. F. B. Jackson; F/O. C. A. Johnson; Sgt. G. R. Johnson; Flt. Sgt. T. Johnstone; Sgt. D. J. Jones; Sgt. H. Jones; Sgt. J. W. M. Jones; Flt. Sgt. R. A. Kerckhove; Sgt. G. Kipling; Sgt. P. Lowe; Sgt. W. McI. McGowan; Sgt. L. R. McGrath; Sgt. J. J. McPherson; F/O. J. N. Mackenzie; Sgt. J. Malpass; Flt. Lt. C. C. Marshall; Sgt. C. J. Matthews; Sgt. N. Metcalfe; Sgt. S. D. Mindel; Sgt. C. R. Minns; Sgt. N. R. Mitchell; Flt. Lt. J. L. Moore, D.F.C.; Sgt. M. J. Morgan; Sgt. E. H. Morley; Sgt. C. C. Mould; Sgt. R. A. Muldoon; Sgt. G. B. Mycock; Sgt. C. A. Neal; Flt. Sgt. A. V. Newell; Sgt. T. A. Oliver; Sgt. C. F. Painter; F/O. F. Parry; F/O. W. Paton; P/O. R. F. Pavely; Sgt. J. Picton; Sgt. R. Pilson; Sgt. R. M. Pinkerton; Sgt. T. H. Pritchard; Wing Cdr. A. C. Rabagliati, D.F.C.; Sgt. L. Rees; Sgt. E. R. Richardson; Sgt. W. D. Robertson; Sgt. J. A. Robson; Sgt G. E. Rose; Sgt. R. M. Scott; P/O. D. M. Sharp; Sgt. A. K. Smith; Sgt. D. R. Spanton; Sgt. G. Sproat; Sgt. E. Stanfield; Sgt. R. W. Stevenson; Sgt. T. M. Sugden; Sgt. G. Thompson; P/O. H. C. Thompson; Sgt. R. H. W. Thompson; Flt. Sgt. E. A. Tipler; Flt. Lt. F. A. G. Tompkins, D.F.C.; P/O. H. J. Trafford; Sgt. E. E. Tyler; Sgt. B. Veall; Sgt. T. E. Warbey; Flt. Sgt. J. C. Welch; P/O. L. S. Welsh; Sgt. G. Wood; F/O. A. Woodward; Sgt. J. E. Woodward; F/O. J. H. Young.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Sgt. J. K. Shipp.

WOUNDED OR INJURED IN ACTION.—Act. Sgt. T. Powers; Sgt. H. C. Wright.

MISSING, BELIEVED KILLED IN ACTION.—Sgt. T. Adair; Flt. Sgt. H. W. Brandon; Sgt. E. H. Davies; F/O. E. R. F. Leggett.

MISSING.—P/O. J. D. Aspin; Sgt. D. B. Asquith; Sgt. A. R. Bailey; Flt. Sgt. G. Bailey; Sgt. A. K. Barlow; Sgt. E. W. Bolt; Sqn. Ldr. R. Bows; Sgt. F. G. Brooks; Sgt. G. McN. Campbell; Sgt. D. B. Carlick; Sgt. W. W. S. Compton; Sgt. D. J. Dennehy; Sgt. W. A. Dykes; Sgt. G. H. Eastwood; Sgt. J. E. Ellis; Flt. Sgt. L. T. Fairclough; Flt. Sgt. D. P. J. Froud; Sgt. S. R. G. Gardiner; Sgt. A. W. Gotham; Flt. Sgt. H. Gregg; Sgt. F. Harman; Sgt. J. A. Holder; Sgt. S. L. Jones; Sgt. J C. Landon; Sgt. J. T. Loveland; Sgt. R. V. Mercer; Sgt. E. L. Morton; Flt. Sgt. J. G. Pollard; Sgt. D. J. Rawlinson; Sgt. W. E. Riley; Sgt. C. W. G. Roberts; Sgt. T. E. Roe; Sgt. C. W. Sherratt; Sgt. W. H. Shirley; Sgt. F. G. Skeet; Sgt. D. N. Stevens; Flt. Sgt. B. A. Stratton; Sgt. H. Thomas; P/O. E. Travers-Clarke; Sgt. A. C. Twitchett; Sgt. J. R. Ward; Sgt. R. S. Watson; Sgt. P. R. Wheeldon; Sgt. B. G. White; Flt. Sgt. E. White; Sgt. T. White; P/O. P. D. Wright.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. W. Ackerman; Sgt. J. W. R. Arnold; F/O. C. J. Ballard; Sgt. W. B. Bostock; P/O. J. Collinson; Sgt. J. Dexter; Flt. Lt. D. J. Dowden; Sgt. E. J. Evans; F/O. B. Hill; Sgt. E. L. King; Sgt. G. Leach; P/O. W. H. Lye; F/O. P. C. Ryde; L.A/C. W. G. Shadbolt; Sgt. H. V. Vaughan; F/O. F. G. Wilkinson.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. A. Clarke.

WOUNDED OR INJURED ON ACTIVE SERVICE.—Sgt. R. Birch; W/O. T. R. Renton; Flt. Lt. F. R. Swynnerton.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—Sgt. J. W. F. A. Grant; Sgt. D. R. R. Pinnington.

DIED ON ACTIVE SERVICE.—A/C.1 R. E. Callear; Flt. Sgt. G. Flynn; L.A/C. P. Loseby; L.A/C. D. H. Stiles.

PREVIOUSLY REPORTED PRISONER OF WAR, NOW REPORTED DIED ON ACTIVE SERVICE.—L.A/C. C. F. Quilliam.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—F/O. W. J. Glenn, D.F.M.; Flt. Lt. T. C. Graham; Sgt. S. Grognet; F/O. J. H K. Langlon; P/O. A. Livesey.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.2 I. M. Caughlin.

Royal Australian Air Force

MISSING, BELIEVED KILLED IN ACTION.—Flt. Sgt. S. N. Campbell; Cpl. K. Kenny; Flt. Sgt. W. McI. M. Lipscomb; L.A/C. G. G. Parkin.

MISSING.—Flt. Sgt. M. H. Foster; Flt. Sgt. A. N. Ingles; Flt. Sgt. R. A. Kingston; Flt. Sgt. H. S. Lister; Flt. Lt. J. P. Thomson.

KILLED ON ACTIVE SERVICE.—Flt. Sgt. R. J. McGowan.

WOUNDED OR INJURED ON ACTIVE SERVICE.—P/O. M. J. Byrne.

Royal Canadian Air Force

KILLED IN ACTION.—W/O. G. N. Matthews.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. G. A. Deering, D.F.C.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Sgt. W. J. Breen; Flt. Sgt. C. B. Cahill; Sgt. R. A. Fraser; Sgt. J. D. Halvorsen; F/O. W. C. Lawrence; Flt. Sgt. R. H. McLean; P/O. N. W. Peat; Sgt. H. C. Pithie; W/O. J. Robertson; F/O. D. R. L. Wilson.

MISSING, BELIEVED KILLED IN ACTION.—W/O. F. F. G. Allan; Flt. Lt. L. H. Cameron.

MISSING.—Sgt. J. D. Bates; Sgt. G. N. Bennett; Flt. Sgt. R. L. Biers; F/O. J. R. Bonneville; Flt. Sgt. D. I. Bowden; F/O. J. H. Cunningham; Flt. Sgt. E. H. Cutler; Sgt. E. Dramnitzki; Sgt. R. E. Gillanders; Flt. Sgt. A. J. Gillis; F/O. J. A. Houston; Flt. Sgt. J. Howell; F/O. R. J. Kee; Sgt. R. G. Kelly; F/O. J. R. Leaman; P/O. D. A. G. McKerry; F/O. G. W. McK. Richter; F/O. D. J. Rioux; W/O. S. L. Roach; W/O. L. G. Rowell; Sgt. P. S. Skebo; F/O. G. A. Smith; F/O. M. Sonshine; Flt. Sgt. N. MacI. Stewart; Flt. Sgt. S. J. Vernon; Flt. Sgt. R. H Wade; Sgt. E. C. Webb; Flt. Lt. E. S. Winn; F/O. A. W. Woolverton; W/O. J. J. Yelland.

PREVIOUSLY REPORTED MISSING, NOW REPORTED PRISONER OF WAR.—Act. Sqn. Ldr. L. E. Logan, D.F.C.

Royal New Zealand Air Force

KILLED IN ACTION.—Flt. Sgt. J. T. W. Hyndman.

MISSING.—F/O. W. F. Hughes.

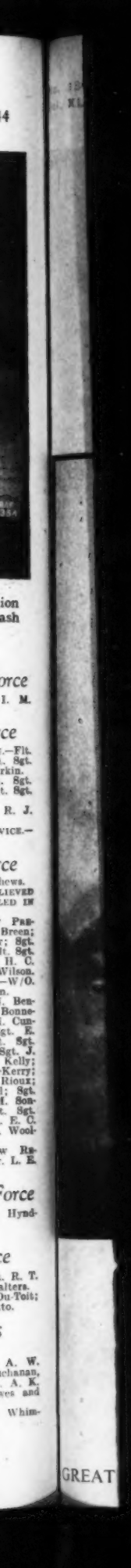
South African Air Force

KILLED IN ACTION.—Lt. J. Barbour; Lt. R. T. Hilditch; Lt. J. P. Thom; Lt. D. D. Walters.

MISSING.—2/Lt. G. R. Cook; 2/Lt. C. Du-Toit; Flt. Sgt P. B. McNeill; Lt. P. C. D. Otto.

Official Corrections

Casualty Communiqué No. 377.

Under "MISSING" delete Act. W/O. A. W. Bennett, D.F.C., Act. Wing Cdr. J. H. Buchanan, D.S.O., D.F.C., L.A/C. E. Eliav, P/O. J. A. K. Ellis, P/O. L. Fischl, W/O. R. C. Howes and Flt. Sgt S. Jacques.

For Sgt. A. Whimpenny read Sgt. A. Whimpenny.